See Announcement on Page 29

COMMERCIAL FISHERIES ABSTRACTS

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FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

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A description of the numbering system is contained in FISHERY LEAFLET No. 232: "FISHERY TECHNOLOGICAL ABSTRACT CARD SYSTEM," by Maurice E. Stansby, K. L. Osterhaug, and F. Bruce Sanford. The Leaflet is obtainable free from this Bureau.

To use the abstracts fully, the reader should cut along the lines dividing them and file them by the number in the upper left-hand corner.

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0.116 CONTINUOUS GAS CHROMATOGRAPHY

Sussman, M. V., and C. C. Huang (Department of Chemical Engineering, Tufts University, Medford, Massachusetts)
Science 156, No. 3777, 974-976 (May 19, 1967)

Continuous gas chromatography would be advantageous in all chromatographic monitoring and preparative applications. Most continuous gas chromatographs use moving packed beds, which have disadvantages arising from the inherent nonuniform flow resistance of a packed bed. Previous work had shown that column height equivalent to a theoretical plate (HETP), a resolution index, is of the same magnitude as the column diameter in capillary chromatography. The smaller the HETP, the greater is the separation that can be done in a unit length of column.

These considerations led the authors to use two parallel, optically flat disk surfaces, coated with a thin layer of solvent and spaced 50-70 microns apart as a high-resolution continuous chromatographic channel. The close disk spacing was expected to produce an HETP comparable in magnitude to the disk separation so that very short gas flow paths would contain a sufficient number of equilibrium stages to cause gas separation. Flow-resistance uniformity was ensured by using optically flat disks held apart by precision spaces.

The chromatographic channel is formed by the opposing parallel disk surfaces, which are 98 mm. in diameter and are coated with silicone grease. The disks are
(over)

 ABSTRACTER: M. F. Tripple

0.6 BARBECUE -- PIT COOKED VS. ELECTRIC COOKER

Abbott, William L. (North Carolina Department of Agriculture, Raleigh)
National Provisioner 152, 18-19 (May 29, 1965)

Introduction.--The current policy of the U.S. Department of Agriculture's Meat Inspection Division requires that the product of electric cookery be labeled as "roast pork with barbecue sauce added." The North Carolina Meat Inspection Service recognizes both electric- and pit-cooked products as barbecue. The only distinction made is that the one prepared over coals may be labeled and marketed as "Pit Cooked Barbecue" and the other as simple "Barbecue." The North Carolina Meat Inspection Service acts on the assumption that the product known as barbecue can be prepared by being roasted in an electric cooker and will have the same characteristics (other than smoky flavor), if not better than, it would have if it were prepared over a bed of hardwood coals. The resulting products are indistinguishable. Having listened to the argument that the only way to produce good barbecue is over coals, the North Carolina Inspection Service supervisor decided to test the matter.

Methods.--Six samples of barbecue were obtained from the regular production line of establishments operating under state inspection. Only one of the samples was prepared by the hardwood-coals method. Fifty people were asked to taste the samples, which were identified only by number, and to record the samples they felt had been prepared over hardwood coals in the old-fashioned method. These people
(over)

 ABSTRACTER: M. F. Tripple

0.38 MOLECULAR SIZE OF HAGFISH MUSCLE LACTATE DEHYDROGENASE

Arnheim, N., Jr., G. T. Cocks, and A. C. Wilson (Departments of Biochemistry and Genetics, University of California, Berkeley)
Science 157, No. 3788, 568-569 (August 4, 1967)

Lactate dehydrogenases of the hagfish, class Cyclostomata, have been studied with regard to their electrophoretic mobility, thermostability, immunological reactivity, and subunit hybridization. It was recently reported that hagfish lactate dehydrogenases are unusually small molecules. The authors, however, present evidence that the muscle lactate dehydrogenase of the hagfish is not a small molecule; it appears to have a molecular size similar to that of lactate dehydrogenase from other species.

Hagfish (Eptatretus [Polistotrema] stouti) were caught and stored at -10° C. Tongue muscles were used as a major source of lactate dehydrogenase. Enzyme activity was estimated spectrophotometrically. The muscle extracts contained 150 enzyme units per milliliter, a value in agreement with values from other vertebrates. The lactate dehydrogenase was stable and survived for 4 years at -10° C. with little loss of activity. The enzyme was also relatively resistant to heat denaturation.

Gel filtration studies with a Sephadex G-100 column were done to estimate the molecular size of lactate dehydrogenase from hagfish muscle. The degree to which the column separated compounds differing in molecular size was determined
(over)

 ABSTRACTER: M. F. Tripple

0.6 (*) LIKES AND DISLIKES OF FISH MEAT PART 2. BY SOME JAPANESE IN HAKODATE

Oishi, Keiichi, Yuko Tamura, and Ayako Okumura
Bulletin of the Faculty of Fisheries, Hokkaido University 15, 116-122 (September 1964)

In an effort to compare the American preference for various kinds of meat with that of the Japanese, the authors prepared and distributed questionnaires to two groups in Japan. The questionnaires listed 26 kinds of fish, 10 kinds of crustaceans and mollusks, 4 kinds of sea animals, and 4 kinds of livestock and poultry. (The list of fish used by the authors for the study was chosen from those sold most abundantly in the Hakodate Fish Market.) The groups questioned were students (male and female) and the staff at the Faculty of Fisheries, Hokkaido University.

The results obtained are summarized in a table presented in the paper. The percentage of the persons who responded, from all the persons who were questioned, is given as answer-percent. The average values of evaluated points and the standard deviation of evaluated points are also presented. A summary of the results follows:

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*Item on back of card.

 ABSTRACTER: M. F. Tripple

CONTINUOUS GAS CHROMATOGRAPHY

LACTATE DEHYDROGENASE FROM HAGFISH MUSCLE

BARBECUE COOKERY

JAPANESE FISH PREFERENCES

0.38

by comparison with proteins of known molecular weight. The enzyme was eluted from the column as a single symmetrical peak. More than 90 percent of the enzyme activity applied to the column was recovered. The elution volume for the enzyme was 38 ml.; the same elution volume was seen with crystalline lactate dehydrogenase from chicken. The molecular weight of the chicken enzyme was about 140,000. No evidence for the existence of a smaller form of lactate dehydrogenase was obtained.

The elution profiles of the hagfish and chicken enzymes were identical when a mixture containing 65 enzyme units of crystalline hagfish enzyme and 4.0 enzyme units of crystalline chicken enzyme were applied to a column. Samples of the eluted material were assayed for enzyme activity before and after heating for 20 min. at 72° C. in the presence of 0.05 percent bovine serum albumin. Activity of the chicken lactate dehydrogenase was unaffected, whereas that of the hagfish enzyme was completely destroyed. Using this property to distinguish between the two enzymes in the mixture, nearly identical elution profiles were found.

The authors showed that lactate dehydrogenase from hagfish muscle does not have an unusual molecular size. Crystalline lactate dehydrogenase from muscle of the lamprey, another Cyclostome, has sedimentation properties like that of all other lactate dehydrogenase examined. Lactate dehydrogenases crystallized from an invertebrate and a bacterium also have molecular weights of about 140,000. It appears probable that the molecular size of lactate dehydrogenase has remained constant during the evolutionary process. [16 references]

0.6

1. The answer-percentage for halibut and tunicates was less than 50 percent. The answer-percentage for most kinds of sea animals exceeded 90 percent.

2. Some shellfish (crab and shrimp), red salmon, tuna, and pork were ranked between "like extremely" and "like moderately." Pork was preferred to beef in Hakodate.

3. Eel, oyster, skipjack, and red sea bream were not rated very high, despite the fact that they are highly appreciated by most Japanese, possibly because the fishing grounds for these fish are far from Hakodate.

4. Skates, sharks, and tunicates were the least liked of the foods surveyed.

5. No obvious difference in likes was found between male and female students.

0.6 FOOD: POSTWAR EXPERIENCE SHOWS IT WAS LATER THAN WE THOUGHT

Walsh, John
Science 152, 896-899 (May 13, 1966)

The problem of food deficit in the underdeveloped countries cannot be simply solved by American surpluses and technology. Other solutions must be sought, such as the production of fish protein concentrate made from species not now commercially sought. [Abstracter: M. F. Tripple]

0.116

held apart by three small spacers whose thickness determines the depth of the gas channel. Both disks are attached to a turntable that rotates in a set direction. Carrier gas enters the chromatograph through the central orifice by means of a stationary bonnet and rotary seal; it flows radially outward through the space between the disks. The mixture to be separated continuously enters through a line that terminates in a tapered nozzle directly opposite the inlet periphery of the radial chromatographic channel. Detectors placed at two points continuously record or collect the separated components. The gas retention time may be less than 1 second, and the continuous disk chromatograph transforms a difference in retention time into a difference in angular discharge position.

Separation is achieved in an extremely short chromatographic channel length and at very high feed-flow rates. Improved separation can be obtained by lowering mixture feed rate, decreasing plate separation, using a more effective solvent phase, and increasing channel length.

Continuous disk chromatography has inherently lower resolution than does a capillary column of diameter equal to the plate-separation distance. The plate separation distances, however, can be made less than the smallest practical capillary diameters, and the loss in resolution may be partially offset. The capacity for magnitudes of disk chromatography is quite a bit higher than for column chromatography, and response time is shorter, usually a fraction of the rotational period.

By making analysis a function of an angular displacement rather than a time displacement, the disk chromatography simplifies all preparative, automatic analyzing and monitoring applications of chromatography. [10 references]

0.6

represented a good cross-section of the population, and the only common characteristic was that they were all quite familiar with pork barbecue.

Results.--Ten percent were able to pick the one sample that had been cooked over wood coals. Forty-four percent picked the sample that had been prepared over wood coals, but they also picked one or more additional samples that they thought had been similarly prepared. Twenty-four percent picked out one sample they felt had been pit cooked, but they were in error. Eighteen percent incorrectly picked two or more samples as having been pit cooked. Four percent were unable to tell if any had been prepared over wood coals.

Conclusions.--It would appear that less than 10 percent of the people can tell the difference between the product resulting from the two methods of cookery. The 10-percent figure is properly discounted to allow for the probability of a random correct selection of one of six samples. If this figure is correct, the author asks, why is it correct to assume that barbecue can be produced only over hardwood coals?

Discussion.--The old-time pit-cooking method requires more expense and labor, and there is the danger of contaminating the product with ashes and soot, as well as the danger of fire and destruction. The electric cooker is cleaner, safer, and requires less labor. An additional benefit is that the rendered fat is caught and saved and can be sold for fat or used for deep frying.

0.6 FOOD'S CURRENT REPORT ON MICROBIOLOGICAL STANDARDS FOR FOODS

Anonymous
Food Processing/Marketing 26, 77-78 (October 1965)

Food-poisoning outbreaks during the past few years have been detected more readily and reported more accurately than ever before. This situation has resulted in pressure on regulatory officials to impose stricter controls on the bacteria content of foods. Surveys are being made to learn more about the microbiological content of various foods and the standards that industry can meet. Regulatory agencies are preparing for closer supervision of the industry. Because of the possibility of stricter controls on bacteria-containing foods and because of the financial and prestige damage resulting from an outbreak of food poisoning, the food processor must take additional steps to safeguard his business.

It is expected that Federal and State regulatory agencies will pay close attention first to foods in which a potential hazard may exist and for which adequate corrective measures are currently available. These foods include frozen or dried products in which a hazard has already been shown, such as precooked frozen foods of a moist neutral nature and precooked chilled foods.

The food producer should consider the following suggestions to safeguard his business and to protect the public. The microbiological implications of all new or novel products should be thoroughly investigated before the products are placed on

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ABSTRACTER: M. F. Tripple

1.017 PROBLEMS WITH AUSTRALIAN FISHING BOATS

(*)
Traung, Jan-Olof (Fishing Vessel Section, FAO, Rome, Italy)
Australian Fisheries Newsletter 26, No. 2, 23-26 (February 1967)

The author describes several types of Australian fishing vessels and suggests ways in which vessels might be operated more safely and economically. Australian fishing vessels are generally of high quality because of good workmanship and good materials. Most of the vessels are under 80 ft. in length; water resistance is low. Less than 5 percent of the 9,426 fishing vessels in Australia have been built from designs done by a naval architect.

Vessels engaged in trawling for prawns range in length from 20 to 70 ft. and many of the smaller vessels are of substandard quality. The larger prawn trawlers usually operate out of fishing ports located in rivers with shallow sandbars at the mouth that change in depth and location. Travel over the bars is dangerous and restricts the draft and size of the trawlers and limits the seaworthiness. The author suggests a large-scale study to determine the specific dangers in operating over a bar and the best design for boats operating under these conditions. Technical improvements suggested by the author include the use of double trawls, power drums for hauling the net, and modified deck equipment.

Some Danish seiners are in operation in Australia. These vessels are usually of round bottom design with a cruiser stern. The author suggests that the

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*Item on back or card.

ABSTRACTER: E. R. Weissman

1.01 WORLD MARKETS AND DEMANDS FOR FISH

Udall, Stewart L. (U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 20240)
Canadian Fisherman 52, 37-38 (June 1965)

In 1963, North America and Europe, combined, purchased approximately 83 percent of the total volume of world imports of fish. As the incomes and populations of North America and Europe grow, the demand for fish will increase markedly, and the type of products desired in these countries will change. Higher incomes will be reflected in a demand for higher-priced products. Because of this shift, producers of the lower valued products are seeking and finding markets in some of the lower-income areas of the world. However, the countries with relatively low purchasing power--Africa, Latin America, and Asia--purchased only about 14 percent of the world import total for 1963.

It has been estimated that over 500 million of the world's 3 billion people are suffering protein malnutrition. A protein deficiency exists in all of Asia, except Japan and Israel; in all of Africa, except the southern tip; in the northern part of South America; and in almost all Central America and the Caribbean countries. To these low-income countries of Latin America, Asia, and Africa, fish protein is a practical way of getting the necessary ingredients into the diet of their undernourished people.

(over)

ABSTRACTER: M. F. Tripple

1.89 NEW ZEALAND AHEAD OF WORLD IN CRAYFISH REARING

Kensler, Craig B. (Wellington, New Zealand)
Commercial Fishing 6, No. 6, 16-17 (June 1967)

At Wellington's Island Bay in New Zealand, juvenile crayfish have been raised and kept alive in a laboratory aquarium. A juvenile crayfish is considered as a small crayfish of about 1 to 1½ inches. In appearance it is quite similar to a shrimp, but it looks exactly like an adult crayfish. Several attempts have been made in other parts of the world to grow juvenile crayfish; however, most of these attempts have failed after 1 or 2 months. Crayfish were kept alive in an American laboratory for 6 months. The crayfish have been kept in the New Zealand laboratory for 18 months and have grown from about 1½ in. in total length to about 4½ in. This latter laboratory is now conducting experiments in crayfish farming on a small scale. It has about 500-600 crayfish in varying stages of growth.

As part of a larger research program investigating the ecology of the common spiny lobster, or marine crayfish (Jasus edwardsii, Hutton) of New Zealand, crayfish were successfully reared and maintained in the laboratory for up to 12 months through the puerulus and post-puerulus stages. The puerulus stage is the last larval stage in the planktonic life of the spiny lobster. At this stage they resemble adult lobsters except they are of a small size, transparent, and able to swim forward. After molting, the crayfish enter the post-puerulus stage, which is the first juvenile stage. At this point they are pigmented and lose the ability to swim forward.

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ABSTRACTER: M. F. Tripple

MICROBIOLOGICAL STANDARDS FOR FOODS

WORLD FISH MARKET

AUSTRALIAN FISHING VESSELS

CRAYFISH FARMING IN NEW ZEALAND

1.01

However, because of economic problems, this part of the world market is outside commercial trade channels. How can private industry assist if this is the case? The author suggests that the latent demand of the low-income countries is being continually stimulated and developed through the process of economic growth. Both the industrialized and the developing countries have policies that stress the importance of continued and expanded economic growth of less well-developed countries, for economic growth has added the major impetus toward maintaining political stability. As economic growth occurs, people of the low-income countries increase their income. And as incomes increase, latent markets become active markets.

Further work is needed to meet this potential demand. The author suggests that North American fisheries interests should be prepared to supply the newly emerging active markets with the fishery products that the countries want and can buy. These products must be low-priced, preservable, and nutritious. An example is the manufacture of fish protein concentrate, which has not received the interest it deserves. If there is improvement in commercially and economically feasible methods of manufacturing fish protein concentrates, many species of fish not now utilized can enter the commercial market and many industrial species may be upgraded. Production of many species of fish found off the North American coasts could be increased many times. Rather than ignore these fish because of lack of marketability, methods should be developed to make them available for marketing.

1.89

Since November 1965, over 3,300 young crayfish have been collected from under rocks in the intertidal zone. Over 70 percent of the specimens died in the laboratory as the result of a failure of the sea-water supply system. A small percentage succumbed to cannibalism or loss of appendages. At the present time, over 800 live juvenile spiny lobsters, in various stages of growth, are being held.

The crayfish are reared in concrete-asbestos tanks that were originally designed as flower troughs. The inside of each tank was painted with epoxy resin and hardener, and an overflow valve was fitted at each end at a total cost of $14.00 for each tank. A continuous flow of sea water is pumped directly from the bay. No attempt is made to control temperature or salinity of the water. Aeration is constantly supplied through a flow of compressed air. Empty shells and rough rocks covered with calcareous algae are placed in each tank for shelter for up to 200 crayfish. The fewer crayfish held in a tank, the healthier they are, and the lower the mortality rate. Cannibalism and loss of appendages are problems that arise from close confinement.

Fresh, live mussel is the favored food of the juvenile crayfish, which are fed every second day. Uneaten food is removed by siphoning, since the crayfish are extremely susceptible to polluted water. Larger juveniles eat on pieces of fresh fish. The crayfish also feed on the tufts of calcareous algae.

Pollution is a constant problem. Early in the experiments, the sea water pumping system frequently stopped, resulting in mass mortality when not immediately corrected. The combined effect of sea-water stoppage and pollution within the tanks caused over 50 percent of all mortality. Coarse sand or small gravel was initially used to cover the bottom of the tanks, but minute particles of uneaten food filtered down. As a remedy, no sediment is now used in the tanks.

0.6

the market. Because of rapid developments and the need to meet the competition, there is often too short an interval between a market test and production. This brevity constitutes a potentially serious microbiological hazard. Sanitary practices should be established and rigidly applied. Initial microbial content of food can affect both keeping time and potential disease hazard. Foods that are not to be thoroughly cooked before they are eaten require rigidly sanitary processing. Established microbiological specifications for the raw ingredients incorporated into the product are needed. Reasonable bacterial-count limits and freedom from specific pathogens should be established, and the products should meet these standards before being marketed.

If the product goes to food processors, the producers should know how the product will be used. It is in the producer's own self interests to guard against ineffective applications of the product. A chemical additive may perform well in laboratory tests but be totally inadequate under different conditions.

Continually evaluating procedures and looking for possible danger spots is highly recommended. Knowledge of the limits of safety will give confidence when the product is marketed. An evaluation mechanism best suited for the particular company's product should be used, as long as it involves rigid microbiological testing as part of the regular quality-control program.

Education is an area with important possibilities. Every person handling the product should be educated in the importance of microbiological control, from factory level to the management and technical levels.

1.017

Danish seiners are often too large for the use to which they are put and might be better used part time for trawling.

The major problem with the southern cray boats is their use of "wet wells" instead of tanks and pumps for storing the live crayfish. Water in the well causes leaks in the bulkhead, invites ship worms, and leads to decay and rot. The western cray boats are much smaller than the southern cray boats and over 60 percent are powered by gasoline engines. Many of the cray boats are on the borderline of safety. The author believes a slower running diesel engine with a larger propeller would give more thrust and would be safer to operate than the present engines with their small propellers. The western boats are also of planing hull design, and the author speculates that a displacement type hull might be more seaworthy and economical.

The major problem with tuna vessels lies in the fact that the catch is kept in sea water and the vessels are thus easily overloaded. Another problem is that of keeping the catch properly chilled. The author notes that, in general, Australian fishermen do not properly ice their catch.

(Abstract of this article appears under 6.10 page 9 - September 1967)

Anonymous
Australian Fisheries Newsletter 25, No. 11, 15, 17 (November 1966)

1.017 RISING INTEREST IN FISH MEAL PRODUCTION

2.115 (*)

ANALYSIS OF MAIN DIMENSIONS, DISPLACEMENT, BLOCK COEFFICIENT, AND SPEED OF A STERN FACTORY TRAWLER

Kupras, L. K.
Paper presented at Meeting on Business Decisions in Fishery Industries, FAO, Rome, September 21-25, 1964
World Fisheries Abstracts 16, No. 3, 13-14 (July-September 1965)

The main dimensions, displacement, block coefficient, and speed of a stern factory trawler destined to catch white fish with trawl nets were analyzed. The trawler can gut and behead fish; produce fillets; freeze and store fish in refrigerated holds; and produce cod-liver oil, fish meal, and oil from fish waste and falloff.

The trawler has a welded hull, two continuous decks amidships, and a long superstructure, also amidships. The engineroom, too, is amidships. Propulsion is provided by a diesel engine; there is a controllable-pitch propeller and four middle-rated generators, two of which supply current for the trawl winch.

The purpose of the analysis was to show how design parameters influence the remaining parameters (economic efficiency, coefficient of deadweight-carrying capacity; ratio of net capacity of holds to displacement minimum, from the aspect of stability; ratio of breadth to draft; minimum ratio of depth to main deck to draft that will ensure adequate volume; number of days at sea) and the relation between optimum block coefficient, speed, and displacement.

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EXTRACTOR: L. Baldwin

2.116 (*)

WARP LOAD AND SPEED RECORDER

Anonymous
World Fishing 15, No. 9, 37-39 (September 1966)

Three types of warp-tension meters are commercially available for use on trawlers. The older two types of meters measure the strain on each warp and indicate the load on dials. The newest meter incorporates a paper-recording mechanism to replace dial indicators. This meter is capable of recording four items of information simultaneously by marking dots of different colors on moving paper at either 2- or 12-second intervals. Recording at 12-sec. intervals largely cancels out spurious irregularities caused by rough seas. Information is fed to the recorder from two electronic strain gauges located at the lower gallows sheaves. This arrangement makes strain measurement independent of the amount of warp paid out from the drum.

The manufacturer sees several possible arrangements for the system. First, it can be used to record separately the load on each warp. Second, a third stylus can be set to give the total of the first two readings and give the total pull of the vessel. Third, the trawler's towing speed can be recorded by the fourth stylus that reads from an electric log.

When the styli recording the individual warp loads are set to a common zero, the line of dots will be superimposed when the loads are equal. Divergence would

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ABSTRACTER: E. R. Weissman

2.115

THIRD TECHNICAL MEETING ON FISHING BOATS

Schaefers, Edward A. (Bureau of Commercial Fisheries, Branch of Exploratory Fishing, Washington, D.C.), and Thomas Pross (U.S. Maritime Administration, Fish Boat Program, Washington, D.C.)
Commercial Fisheries Review 28, No. 8, 5-10 (August 1966)

The Third Technical Meeting on Fishing Boats, arranged by the Food and Agriculture Organization of the United Nations (FAO), was concerned with improving the design and efficiency of small fishing vessels (those of about 100 gross tons or less). The following subjects were discussed: techno-socio-economic boat problems, seakindliness and workability, engineering of inboards and outboards, new materials for vessels, design of boats that are under 20 gross tons, design of boats that are from 20 to 100 gross tons, and recent developments in fishing vessels.

Since 80 percent of the world's fish catch is taken on or near the Continental Shelves by small vessels, the importance of small fishing vessels was stressed at the meeting. The growing shortage of fishermen was discussed, with particular reference to countermeasures employed by the Japanese fishing industry. In Japan, the emphasis has been shifted from trying to produce more fish to trying to maintain present production and cost levels by increased mechanization and by greater use of synthetic fiber nets and plastic hulls.

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ABSTRACTER: E. R. Weissman

2.119 (*)

SHOAL WATER DIVING DEVICE MAY AID BOATMEN

Getchell, David R.
National Fisherman/Maine Coast Fisherman 46, 50 (June 1965)

A low-cost underwater breathing device has been invented by a Pennsylvania engine manufacture. Designed for emergency work at shallow depths, the device could prove invaluable for the vessel disabled because of a net in its wheel or by some other minor underwater difficulty that might be corrected if only someone could get at the cause. It may save some boatowners and commercial fishermen hundreds of dollars. The device has many possibilities inshore, too, from use in checking, repairing, and finding moorings to use in freeing anchors, fixing floats, and checking shellfish bottoms.

The underwater breather is not a piece of sporting equipment. It was designed for emergency work in up to 15 feet of water. Claims are that if it is used according to instructions, it is perfectly safe for anyone who can swim; if used within its limits, it should prove to be inexpensive insurance.

The device was designed for simplicity, and therein lies both its strength and its weaknesses. Little can go wrong with it in use; the air pack has a built-in safety feature that gives the diver plenty of time to surface should the pump or pumper fail. However, because of its simplicity, the device is lacking in some features common to other diving apparatus. Inconvenience and some discomfort could result should the equipment be used over a long period of time.

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ABSTRACTER: M. F. Tripple

ANALYSIS OF STERN FACTORY TRAWLER

IMPROVING SMALL FISHING BOATS

WARP LOAD AND SPEED INDICATOR

DIVING DEVICE FOR BOATMEN

2.115 (Cross Reference: 9.4)

FAO naval architects have used computers to design vessels of a given size and use. This method will greatly simplify and improve the accuracy of the design, as well as help produce vessels that have maximum sea-keeping qualities and fishing performance. The major development in the design of small fishing vessels is the trend toward vessels capable of doing several types of fishing.

Catamarans and devices for single-hull vessels were discussed in connection with improving the seakindliness of fishing vessels. The advantages of a catamaran include its large working platform, increased stability and excellent maneuverability (because of the twin engines), greater cargo and living capacity, and ease of conversion to a variety of types of fishing. Disadvantages include the cost of construction and operation. The paravane-type stabilizer, or "flopper stopper," and passive free-surface tanks for roll damping were also discussed. The former are in extensive use on the Pacific Coast of the United States and Canada; no performance data were given for the latter.

Materials for vessel construction were discussed. The talks centered on fiberglass reinforced plastic and aluminum, both of which were reported to have advantages of lighter weight, less need for maintenance, and relative ease of repair over conventional boat-building materials. A new method of fitting ship hulls with wraparound skins was said to save 25 percent in labor costs when compared with conventional methods.

2.119

The underwater-breathing device consists of a simple rubber, foot-powered air pump that is operated by a person aboard the boat. A 25-foot plastic hose goes from the pump to a small canvas air pack, which the diver wears on his shoulders. A slightly larger hose leads from the pack to a rubber mouthpiece. Once the air pack is filled with fresh air, it floats upright behind the diver's head; this orientation keeps water out of the pack. The diver pulls air through the breathing tube and expels it back into the pack. The excess air escapes through an opening in the bottom of the pack. However, the diver does rebreathe some of the expelled carbon dioxide, which might cause some discomfort if he were to stay underwater for 15 minutes or more. A few minutes of fresh air will cure this discomfort, suggests the manufacturer.

During tests, a person could stay underwater for 5 minutes without discomfort. By breathing slowly and exhaling strongly, the diver can get sufficient air, but on the boat the person pumping must keep his mind on the job and his foot going steadily. The small foot pump must be operated at its full capacity at all times to drive air down to the diver. A fairly heavy diving belt is needed to counteract the buoyancy of the air pack.

(Abstract of this article appears under 9.19 page 19 - January 1966)

Gusel'nikov, V. I., M. I. Onufrieva, and A. Ya. Supin
Federation Proceedings Translation Supplement 24, T768-T772 (September-October 1965)

2.143 PROJECTION OF VISUAL, OLFACTORY AND LATERAL LINE RECEPTORS IN THE FISH BRAIN

2.115

The author assumed that the following criteria and conditions would affect the choice of main dimensions, block coefficient, speed, and displacement: approximate criterion of minimum stability, economic criterion, and condition that equations of weights and volumes must be simultaneously true.

The basic calculations were made according to a preliminary program especially worked out for the analyses.

The results of the calculations are detailed, and substitute equations are given for the functions investigated.

Concerning the stability of a ship subjected simultaneously to a transverse wave impact and to a gust of wind, expressions are given for determining (1) the reserve of stability remaining after heeling caused by a static wind of force equal to the gust, (2) the dynamic heeling effect of the gust (assuming a linear variation of the righting moment), and (3) the heeling effect of the wave impact (an empirical expression). Corrections allow for the additional effect of fishing operations (for example, trawling). Simplifications are suggested for practical cases. [Extractor: L. Baldwin]

Anonymous
J. Brit. Ship Res. Ass., Abstr. No. 22,470 (January 1965)
World Fisheries Abstracts 16, No. 1, 11 (January-March 1965)

2.115 STABILITY CRITERION FOR FISHING VESSELS

2.116

indicate a snagged board, too tight a turn, or some other abnormal condition. The total load reading, used in conjunction with the two individual readings, can indicate whether one warp has taken the whole strain, the whole gear is snagged or capsized, or if the cod end is too full. This reading may also be used to trip an alarm or release the winch brake when the total load exceeds a preset level.

The manufacturer reports that the recording mechanism used in conjunction with a headline sounder to measure the gape of the trawl mouth will allow more efficient fishing. Trial tows, made over a smooth bottom with no current and no wind, will produce information on the warp loadings and towing speed that give optimum trawl performance. With this information in hand, total warp load can be compared with ship's speed to detect an inefficient actual towing speed caused by untoward sea conditions, such as a strong bottom current. For pelagic trawling the same information would allow more certain control of the trawl depth.

The strain gauges used are compact metal cylinders about 4 × 4½ inches. They are said to be practically indestructible. The rest of the components are standard items, making service and replacement simple.

(Abstract of this article appears under 1.0149 page 3 - September 1966)

Anonymous
World Fishing 15, 31-34 (January 1966)

2.118 ITALIANS ENTER THE FREEZER TRAWLER ERA

3.15 IRRADIATION OF FOOD

Sheard, Harold
New Scientist 28, 351-352 (November 4, 1965)

There are several causes of food deterioration: microorganisms; enzyme action, which produces chemical changes; normal biological processes; and insects. Large enough doses of ionizing radiation can delay or prevent all of these factors. Radiation treatment offers a process that would enable raw foodstuffs to be stored and distributed without being frozen or cooked. However, there are side effects that limit the usefulness of this method of food preservation.

A major difficulty is that a high dose of ionizing radiation produces small quantities of substances that are unpleasant to taste and smell. This side effect varies with the dose level and with the food treated. In sterilizing raw meat to eliminate Clostridium botulinum, a minimum dose of 4.8 megarads is necessary. The doses required to eliminate enzyme activity are much higher. Even 4.8 megarads produces intolerable smells and tastes. The high-dose treatment of foods for complete sterilization may not be acceptable.

The technique of "radiation pasteurization" has much potential. The refrigerated shelf life (0°-4° C.) of many foods can be extended through the use of ionizing radiation to reduce the initial population of microorganisms. Doses of not more than 0.5 megarad can accomplish this reduction, and the odor/flavor problem is

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 ABSTRACTER: M. F. Tripple

3.234 FREEZE-DRIED FOOD BOOM TO AID [FROZEN FOOD] PROCESSORS

Anonymous
Processing and Freezing 38, 1, 18 (July 1965)

Kermit Bird, economist for the U.S. Department of Agriculture, predicts that the volume of freeze-dried food will increase by from 10- to 20-fold in the next 5 years. He points out that a new product must at least double its volume yearly for the first few years if it is expected to be successful in the market. Translated into figures, then, the 1970 volume of freeze-dried foods will be somewhere between 250 and 500 million pounds.

Freeze-dried versus frozen foods.--Mr. Bird recognizes that people who have invested in freezing or cold-storage facilities are concerned lest freeze-dried foods drive frozen foods from the market. He believes their fears are groundless. In the first place, he points out, freeze-dried foods as a whole are not comparable to frozen foods, despite the fact that some particular freeze-dried products are as good as, or even superior to, frozen products. Any item that has started out frozen and gone through 8 to 10 hr. of drying can not be expected to be superior to the original product. Palatability tests have confirmed Mr. Bird's opinion. Thus, freeze-dried foods will take the place of other dried foods, not frozen foods.

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 ABSTRACTER: L. Baldwin

3.231 REVOLUTION IN FREEZING EQUIPMENT

Shelton, Duane D.
Quick Frozen Foods 27, 29-32, 166-167 (June 1965)

Introduction.--In the early days of commercial food freezing, equipment was largely limited to three basic systems: air-blast freezing, contact-plate freezing, and brine-immersion freezing. The frozen-food industry was still using these three basic systems as late as the early 1960's. The marketing success of individually quick-frozen (IQF) vegetables was an indication to the industry of the need for new types of freezing equipment. Innovations in blast freezing led to the freezing of these products on continuous moving belts in a blast-freezer tunnel by two basic methods: (a) the product was spaced out on the belt to avoid clustering and (b) mechanical means were used to break up frozen clusters before packaging. Although this kind of freezing satisfied the basic requirement of supplying IQF products for the predominantly institutional market, it was neither very efficient nor very productive. For the production of IQF products, the development of new systems that offer high-speed production and improved product quality was one of the most decisive phases of the revolution in food freezing. There have been many recent developments in this area, but three are of particular interest.

New freezing concepts.--(1) The "fluidized bed" version of the continuous-belt, blast-freezer tunnel not only freezes the product quickly, but also keeps

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 ABSTRACTER: M. F. Tripple

3.3344 INDUSTRY FIGHTS "BLUING" TO PLEASE CONSUMERS' EYE

Anonymous
Pacific Fisherman 63, 41 (June 1965)

"Bluing" refers to the color that king-crab blood turns when it goes through normal processing operations. Because the blood of the king crab contains a high percentage of copper, when the crab is processed, it oxidizes and turns a gray-blue. This blood is as pure and healthful as roast-beef blood, but the color makes it very undesirable from a consumer standpoint. For this reason, much time and money have been spent on the bluing problem by the king crab industry. One of the proposed solutions to the problem is a two-stage cooking process.

The theory behind the two-stage process is that the first cooking--at 150° to 165° F.--is warm enough to coagulate the protein, or meat part of the crab, but is not hot enough to coagulate the blood and other undesirable liquids in the crab. After the first cooking, the firm meat can be removed from the shell without damage to its texture or shape. The blood and other fluids are washed away prior to the second cooking, which "sets" the protein and prevents it from leaching away during the retorting process.

Some king crab processors have other thoughts about the best method of preventing bluing. They believe that a single, fast cooking at high temperatures is a

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*Item on back of card.

 ABSTRACTER: M. F. Tripple

ASPECTS OF FOOD IRRADIATION

NEW FREEZING EQUIPMENT

FREEZE-DRIED FOODS

"BLUING" OF KING CRAB

3.231

it virtually suspended in the air in a churning, fluidized stream as it moves along the belt. This suspension not only ensures that maximum surface area will be exposed to the cold air, but also speeds up individual freezing and prevents clustering. This type of equipment, in which a blast of cold air is blown directly up through the moving belt, had gained wide acceptance for a variety of vegetables, fruits, and seafoods by the beginning of 1963. (2) A Swedish company took a further step: a basic fluidized bed freezer was combined with a rack-tunnel freezer so that the same enclosure and the same refrigeration source were used. This system is designed to provide maximum flexibility for plants packing a variety of products, both IQF and prepackaged solid pack. (3) The third major development in the area of IQF vegetable processing was the introduction, in 1964, of a self-contained mobile version of an IQF fluidized freezer. The unit is mounted on two trailers and provides the packer with a supplementary freezer when and where desired, and for as long as it is desired.

Summary.--There is a threefold aspect to the revolution in the frozen-food industry. The first aspect consists of the adaptation of older, conventional systems to new tasks. The second phase consists of the custom-engineering of new systems designed for freezing specific types of products and for broadening the range of successfully frozen products. The third aspect, and conceivably the most important, is the vast amount of technological research that has opened the door to the many food-freezing developments now available, as well as to others that will surely come.

3.15

not serious. The storage life of white fish on ice can be increased with this method. The fish receive the radiation dose after the fillets are prepacked in plastic bags.

The pasteurization method can inhibit the growth of mold in soft fruits. There are also processes in which 0.5 to 0.1 megarad is used for eliminating Salmonellae food-poisoning organisms from frozen eggs and meat. Lower radiation doses will stop root crops from sprouting.

Although there are a number of technically feasible ways of preserving food with ionizing radiation, none of these processes are currently in commercial use. A major economic factor is that most of the food radiation processes will be commercially acceptable only if they can be done on a large enough scale. A radiation-processing plant will require extensive shielding and elaborate mechanisms to move the products to and from the irradiation chamber. Consequently, capital costs will be high. In terms of cost per unit of product treated, large plants will be more profitable than small plants. Because of the high capital costs and small running costs, the continuously operating plants will be the most economically effective.

Because use of high-radiation doses for complete sterilization seem to have limited possible applications, the original hopes for the widespread use of ionizing radiation for food preservation are now dimmed. However, there are a number of medium- and low-dose processes that can be quite useful. Economic considerations will determine the rate at which these processes are used commercially. The final determining factor may be public acceptance of irradiated foods.

3.3344 (Cross Reference: 1.86)

better method of combatting bluing problems. Fast cooking coagulates the blood so that it can be easily separated from the meat during the washing process. The proponents of this method also say that a single, fast cooking coagulates all the protein; in contrast, double cooking allows some of the protein, and thus the flavor, to wash away with the undesirable fluids during the washing process.

From 10 to 50 percent of the total body weight of a king crab is composed of blood. This amount depends on the recency of molt and the time of year. Whatever the percentage, it creates one of the most perplexing problems facing the industry. [Editor's Note: See also "Observations of the "blueing" of king crab, Paralithodes camtschatica" by H. S. Groninger and John A. Dassow, Fishery Industrial Research 2, No. 3, 47-52 (November 1964)]

3.3343 CANNED SHRIMP

Anonymous
Fiskeriministeriets Forsgslaboratorium, Report 1964
Abstracts from Current Scientific and Technical Literature 18, 2833, p. 535
(November 1965)

A small addition of citric acid to canned shrimp brine improves quality. Shrimps were packed with 0, 0.3, and 0.9 percent citric acid added to the brine. The shrimp are being analyzed by gas chromatography and the results will be made available.

3.234

Refrigeration requirements for freeze drying.--In the second place, since freeze-dried food uses frozen food as the raw material, the freezing industry will be doing part of the freeze-dry processing. About 1.5 to 1.8 tons of refrigeration are required to freeze 100 pounds of food per hour. By 1970, freezing requirements may reach 300 tons of refrigeration. Sublimation also requires refrigeration if vacuum pumps with a mechanical refrigeration system are used instead of steam jet pumps. Although the refrigeration required for sublimation varies with the product, the moisture in the food, the installation, and the temperature of the condenser, refrigeration requirements may reach as high as 10 tons per 100 pounds of ice per hour. Thus by 1970, the industry may need an additional 3,600 tons of refrigeration to sublimate the ice of the foods being freeze dried.

Freeze-dried products.--The main products being freeze dried are shrimp, crab, chicken, beef, pork, ham, mushrooms, coffee, strawberries, peaches, green beans, green peas, and chives. About five kinds of freeze-dried coffee are being marketed. One company is market testing strawberries, blueberries, and peaches with its breakfast cereal; another is testing bananas with its cereal; a third is testing freeze-dried blueberries in its muffin mix. A dairy company is marketing spray-dried omelets containing freeze-dried ham and mushrooms. A soap company has a line of freeze-dried dinners on the market, and a tomato-products processor has a series of freeze-dried dinners and sauces ready for test marketing. Other items in various stages of testing are beer and wine, squid, and shrimp for fish bait.

3.2349 NEW EASTERN FREEZE-DRY LOOKS TOWARD PLANT EXPANSION

Anonymous
Frosted Food Field 38, 4, 6 (May 1965)

Although now handling up to 2,500 pounds per day of wet mushrooms, seafoods, fruits, and vegetables, a Lancaster, Pa., freeze-dry firm will shortly start expanding towards a 15,300-pound capacity. New features that cut the freeze-drying cycle 30-50 percent (from 10-14 hours to 5-11 hours) permit the sixfold expansion.

Freeze-drying systems.--The process begins at the adjoining parent company, where the food is washed, sized, inspected, diced, or sliced, and then individually quick-frozen and assembled in production quantities. The freeze-drying system takes over in the coldroom, where temperatures never exceed 0° F. Here the food is loaded on trays. The trays are loaded on trucks, which are moved by monorail to the drying chamber. The total loading operation, including loading the freeze-drier, takes less than a minute. After the freeze-drier is loaded and sealed, the only manual action in the whole automatic vacuum-drying process occurs--an attendant presses the "start" button.

Chamber pressure is reduced and the vacuum-heating process begins. Food trays hang suspended between heating shelves, which have a high-emissivity coating that provides maximum heat radiation. The interior walls of the chamber are specially coated to prevent heat loss and ensure uniform drying.

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 ABSTRACTER: L. Baldwin

3.25 "PIGGY-BACK" TRANSPORT SYSTEM
(*)

Anonymous
Modern Refrigeration 68, 470 (May 1965)

The major components of the "piggy-back" system for transporting chilled and frozen foods by truck are insulated aluminum boxes fitted atop a special flat-bed trailer. The trailer is equipped with its own forklift truck and ramp, which permits one-man operation. The purpose is to cut transport and handling costs of perishable foods. Costs are also cut by eliminating the need for expensive two- or three-compartment refrigerated trailers.

Tests have shown a temperature rise of only 10° after 18 hours for ice cream that was put in the aluminum containers at -15° F. During the tests, the outside temperature averaged 90° F.

The containers are made of aluminum sheet and polystyrene insulation. The test containers are 46 inches square and 70 inches high, outside dimensions. Internal dimensions are 40 by 40 by 64 inches, which provides 59 cubic feet of storage space. Twenty-two boxes in two rows will fit on a 48- by 9-foot trailer. The weight of the aluminum polystyrene-laminated containers with heavy-duty wood pallets is 340 pounds, with legs. This weight offers a substantial saving over steel.

Two refrigeration systems are available for longer hauls. One system uses individual units on each container. The units are powered by an electric

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*Items on back of card.

 ABSTRACTER: M. F. Tripple

3.2385 WHAT'S IN A PACKAGE?

Anonymous
Fish Boat 10, 35, 37 (May 1965)

For those who thought that the only thing a package contains is the product, this article broaches a new thought. Experts say that everything is in the package--the company's reputation, investment, and profit or loss. The quality of the product counts in keeping a customer, but it is the package that gets the customer in the first place, and it is the package that maintains the quality down to the consumer level and ensures repeat business.

A recent study revealed that although consumers give varying reasons for choosing a product, they are strongly influenced by what is on, not what is in, a package. Half of the people in the study were merely told to taste and then rate the product. Although the product in each package was identical, the packages were different. The other half were told that the packages had been designed to coincide with differences in the taste of the product. Thus, they were not only to evaluate the product's taste, but also to indicate if the package design successfully communicated taste differences between the products. Although one would expect the people in the study to recognize that all the samples tasted alike, no one did, and different sample attributes were ascribed to each design. More important was the fact that both the instructed and noninstructed people similarly described the products. The people who did not know that the package was

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 ABSTRACTER: M. F. Tripple

3.61 TUMBLER FREEZER-DRYER
(*)

Fox, Howard
Food Manufacture 40, 58-61 (March 1965)

A new type of freeze-drier suitable for processing piece materials is being developed at the Western Regional Research Laboratory of the United States Department of Agriculture. In it, the product tumbles from one hot surface to another as the drier rotates. Tumbling allows for uniform exposure of different sides of the piece and reduces the drying time for the average piece. Better quality is attained by mixing the pieces, for thus the spread between the time needed to dry the slowest and the fastest piece is shortened. Materials are handled in bulk, thereby eliminating the need for trays.

An essential feature of successful freeze drying by tumbling is the high ratio of the heat-transfer surface to the product weight. A design using horizontal, longitudinal finned tubes has been evolved. The fins are much wider and fewer than are those customarily found in other designs. The finned tubes are arranged in the drier drum so that the fins hold the product as the drier rotates. If the entire drier body is not filled with the product, space is left between adjacent finned tubes, and tumbling and easy flow of water vapor are permitted.

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 ABSTRACTER: M. F. Tripple

THE FREEZE-DRYING PROCESS

INFLUENCE OF PACKAGING ON THE CONSUMER

COMPARTMENTED TRANSPORT UNITS

TUMBLER FREEZE-DRIER

3.2385

a reference made judgments similar to those who had been told it was a reference. The graphics that were designed to suggest flavor differences succeeded quite well.

The generalizations that can be made from this test are that a successful design will communicate a similar message to most consumers and a less successful design will communicate confused messages through its graphics.

The consumer views packaging as a convenience to him, not as a method for the seller to sell more products. He wants appropriate packaging materials (materials he believes give maximum protection, not necessarily what the processor knows is the best); attractive but realistic graphics that suggest tasty meals without being too elegant; and useful, easy-to-prepare recipes.

These complex consumer attitudes present a serious challenge to the fish and seafood industry, and more attention must be given to analyzing these attitudes. A number of leading fish and seafood firms have been giving more attention to package design and consumer attitudes in recent years, but the majority of the industry still seems to believe the package is only to hold the product. Although most seafood processors cannot afford extensive research on motivation or design, all can take advantage of the continuing studies being conducted by marketing and industrial design organizations.

3.61

Comparison of drying rates between the finned-tube drier and a conventional vacuum shelf drier shows a higher initial drying rate for the finned-tube drier but a more abrupt completion time; total drying time is approximately one-half that for the shelf drier. Also, since no wet spots remain, determination of the proper time to stop the run for the desired moisture in the product is easier.

Pictures of the drier are included. [Abstracter: M. F. Tripple]

3.61 CONTINUOUS ELECTROSTATIC, INFRARED CURING PROCESS

Tillner, D. J., Z. E. Sikorski, and E. Dunajski
Przem. Spozyw. 18, No. 6, 32-36 (1964) (In Polish)
Abstracts from Current Scientific and Technical Literature 18, Abstract No. 1639, p. 314 (July 1965)

An electrostatic, infrared curing-tunnel apparatus and its application for the continuous curing of fish and meat products are described.

3.6 DRIER IN THE SYSTEM

Komedera, M.
Modern Refrigeration 68, 449-450 (May 1965)

(Abstract of this article appears under 0.12 page 1 - February 1966)

3.2349

When the drying cycle is completed, the food trays move by monorail to the humidity-controlled packing room, where they are manually unloaded, and the product is rushed into airtight containers to prevent its absorbing moisture from the air. Thus protected, the product can be stored almost indefinitely without refrigeration. The food's cell structure, along with its flavor and nutritional values, remains intact.

Vacuum freeze-drying method.--Vacuum heating evaporates ice content without melting either the ice or the product. Unlike other drying methods, vacuum freeze-drying removes the moisture from a receding ice layer, leaving the outer section of food dry, the inner one saturated. A product that has been vacuum freeze-dried resembles a sponge; it will revert to its original form when water is added. Heating amount and rate are automatically controlled so the water sublimates from the frozen state. A programmed cycle provides maximum heat input consistent with maintenance of proper pressure and avoidance of damage to the product.

Cost of process.--Although at the operating level, the process is more expensive than other processes, since it involves one more operation (first freezing, then drying), it offers true savings at the transportation and storage levels. Only the basic material is shipped--there is no water to make for dead weight--and no refrigeration equipment is necessary. Since volume is less, more product can be packed into each vehicle. Once it arrives at the warehouse, it need not be rushed to the coldroom--it can be stored at room temperature.

3.25 (Cross Reference: 2.5)

generator on the truck. The second system has a central gas-refrigeration unit with individual connection to each container. Both systems utilize thermostatic control to provide optimum temperatures for the products in each container. After being taken from the truck, the containers with individual compressors can be hooked up to store power.

When the system is in use, the driver removes the forklift truck from its carrying rack on the back of the trailer by the ramp and unloads the full containers from either side of the trailer. Empties are reloaded in their place.

Containers could be provided to meet special customer needs. The test containers are designed for multiple, standard-sized milk cartons and frozen-food packages.

The author discusses advantages and problems to be weighed before the manufacturer decides to buy, hire, or contract for a vehicle fleet.

3.25 ECONOMICS OF OPERATING REFRIGERATED VEHICLES

Gibbins, R. M. G.
Food Manufacture 39, 53-54, 57 (October 1964)

3.25 RUNNING A VEHICLE FLEET

Dunbar, C. S.
Food Manufacture 39, 37-38 (October 1964)

ELECTROSTATIC, INFRARED CURING

OPERATING REFRIGERATED VEHICLES
RUNNING A VEHICLE FLEET

4.11 (*) CALCULATION OF ECL VALUES IN THE GAS-LIQUID CHROMATOGRAPHY OF MULTIPLE-BRANCHED FATTY ACIDS

Ackman, R. G. (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of Chromatography 28, No. 2, 225-231 (June 1967)

A previous gas-liquid chromatography study of the saturated fatty acids of marine lipids provided evidence of the occurrence of three multiple-branched fatty acids in lipids from all higher animal species. Subsequent work indicated that these multiple-branched fatty acids were probably 4,8,12-trimethyltridecanoic, 2,6,10,14-tetramethylpentadecanoic, and 3,7,11,15-tetramethylhexadecanoic acids. Additional studies by the author were carried out with both butanediol succinate (BDS) polyester and silicone (SE-30) open-tubular (capillary or Golay) columns. Esters of authentic samples of 2,6,10,14-tetramethylpentadecanoic and 3,7,11,15-tetramethylhexadecanoic acids were used to confirm the identity of these two multiple-branched acids on both column substrates. Petroleum was shown to contain 3,7,11-trimethyldodecanoic acid in association with 2,6,10,14-tetramethylpentadecanoic acid; however, comparative analyses with the ester of an authentic sample showed that only traces of 3,7,11-trimethyldodecanoic acid were present in the examined marine lipids.

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ABSTRACTER: M. F. Tripple

4.29 CHARGE TRANSFER COMPLEXES OF LIPIDS WITH IODINE

Bhowmik, B., G. L. Jendrasiak, and B. Rosenberg (Department of Biophysics, Michigan State University, East Lansing)
Nature 215, No. 5103, 842-843 (August 19, 1967)

There is much interest in the role of charge transfer interactions in biology, and a study was made of the semiconductive properties of lipids in the solid state. When lipid molecules were exposed to iodine vapor, they showed a large increase in electrical conductivity with a concomitant decrease in the activation energy from the dry state value. A charge transfer mechanism may be involved, and the authors investigated these possible charge transfer mechanisms.

Iodine in carbon tetrachloride was added to a solution of lipids in carbon tetrachloride, and a change occurred in the original violet color of iodine. Lecithin was added to lipids, and two new absorption bands appeared in the region of 366 mμ and 294 mμ. When the concentrations of iodine and lecithin were varied, new bands came from a 2:1 complex between lecithin and iodine.

Iodine formed an outer complex with cholesterol. The visible iodine band at 518 mμ shifted to 509 mμ when cholesterol was added, and a new band appeared at 332 mμ where both donor and acceptor have no absorption. The band at 332 mμ was considered to be a charge transfer band. By varying the concentrations of cholesterol and iodine in carbon tetrachloride, the new band came from a 1:1 complex formation.

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ABSTRACTER: M. F. Tripple

4.11 QUANTITATIVE THIN LAYER CHROMATOGRAPHY OF LIPIDS

Cuzner, M. Louise, and A. N. Davison (Department of Biochemistry, Charing Cross Hospital Medical School, London, England)
Journal of Chromatography 27, No. 2, 388-397 (April 1967)

Thin-layer chromatography is routinely used for the separation of all classes of lipids and has been adopted to provide the basis for quantitative analysis of separated lipids. Methods of analysis based on densitometric measurement of spots visualized under standard conditions have been described. Some researchers prefer to scrape off the spot and extract the lipid repeatedly with methanolic solvent mixtures, others directly ash each area of separated lipid and determine the released phosphate.

A previous report gave a preliminary account of both the principles and application of an alternative method that provides for the complete recovery of intact lipids and their estimation after prior separation on thin-layer chromatograms. The described technique is based on preliminary separation of total lipids on thin-layer plates of silicic acid with a second stage column chromatography, if necessary. This procedure allows complete recovery of intact lipids from naturally occurring lipids. Further details are given of the improved technique and its application in the analysis of various tissue lipids. Special attention is given to the separation of certain minor lipid compounds.

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ABSTRACTER: M. F. Tripple

4.92 (*) AETIOLOGY OF MULTIPLE SCLEROSIS

Bernsohn, Joseph, and Leo M. Stephanides (Neuropsychiatric Research Laboratory, Veterans Administration Hospital, Hines, Illinois; Department of Biochemistry, Northwestern University Medical School, Chicago, Illinois)
Nature 215, No. 5103, 821-823 (August 19, 1967)

One hypothesis of the etiology of multiple sclerosis is that the disease is a result of dietary deficiency of polyunsaturated fatty acids. At least two of the polyunsaturated fatty acids, linoleic and linolenic acid, have different biological functions. α-Linolenic acid is required for the biosynthesis of the longer chain ω3 fatty acids. Two principal dietary sources of ω3 fatty acids are a variety of seed and marine oils. Marine oils have a high content of C_{20}- and C_{22}-unsaturated fatty acids; oils from fresh-water fish contain C_{18}-unsaturated acids. Cod-liver oil is reported to contain 0.7 percent 18:3 and 8.7 percent 22:6. Fish oils from sardine, herring, menhaden, and mackerel are rich in C_{20}- and C_{22}-unsaturated acids. The principal site of lipid storage in fish is the liver, and the amount of lipid present in other sites depends on the nutritive condition and the species. It would appear that where the whole fish is consumed, an increased supply of ω3-type acids would be available. The antioxidizability of these highly polyunsaturated fatty acids is relevant to fish oils. Drying the fish, lengthy exposure to air, and excessive cooking cause peroxidation or polymerization of the essential fatty acids and alter the amount of protective factor available.

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ABSTRACTER: M. F. Tripple

CALCULATING EQUIVALENT CHAIN LENGTHS OF FATTY ACIDS

QUANTITATIVE CHROMATOGRAPHY OF LIPIDS

CHARGE TRANSFER COMPLEXES OF LIPIDS

ETIOLOGY OF MULTIPLE SCLEROSIS

4.11

In the preliminary studies, mixtures of chloroform and methanol with water or aqueous ammonia in different proportions were compared as developing solvents for individual standard lipids and for mixed phospho- and galacto-lipids on thin-layer plates. Solvent mixtures of chloroform-methanol-ammonia (17:7:1) at 32.5 or 20.2 percent weight per volume were found to be quite reliable for the separation of individual phospholipids and cerebrosides and were both used in the analysis of the lipids of various tissue fractions, such as myeline, microsomal membrane, and erythrocyte ghosts. The mixture at 20.2 percent weight per volume resolved cardiolipin at the expense of monophosphoinoside, and it was used for the separation of mitochondrial lipid, which contains cardiolipid as a major component. A mixture of chloroform-methanol-water (14:6:1) was quite reliable for the separation of both cerebrosides and sulfatides; however, clear separation of phospholipid was frequently not seen.

The methods described are designed to provide a rapid and reproducible means of quantitative separation of complex lipid mixtures. Recovery of lipids from silicic acid zones by elution in columns has the following four advantages: (1) it is time saving in that it avoids repeated shaking and extraction of silicic acid; (2) it results in the recovery of intact lipid and thus does not limit the use of analytical methods; (3) silicic acid is eliminated from the recovered lipid and thus cannot interfere with color development or add to blank values; and (4) recovery of intact silicic acid-free lipid allows the method to be used for separation of labeled lipid. [34 references]

4.92

The authors correlated known epidemiological data with the distribution of foods containing fatty acids of the linolenic acid type and made several points about the incidence of multiple sclerosis. More basic data are needed before the theoretical aspects of the problem can be fully elucidated. There is some evidence that a lack of certain fatty acids during maturation of the brain results in demyelination. [45 references]

4.92 MUSCLE DYSTROPHY OF CARP DUE TO OXIDIZED OIL AND THE PREVENTIVE EFFECT OF VITAMIN E

Hashimoto, Yoshiro, Tomotoshi Okaichi, Takeshi Watanabe, Atushi Furukawa, and Takeshi Umezu
Bulletin of the Japanese Society of Scientific Fisheries 32, 64-69 (January 1966)

(Abstract of this article appears under 9.14 page 19 - September 1966)

(Abstract of this article appears under 4.13 page 15 - November 1966)

De Kontng, A. J.
Journal of the Science of Food and Agriculture 17, 112-117 (March 1966)

4.13 PHOSPHOLIPIDS OF MARINE ORIGIN. I - THE HAKE (MERLUCIUS CAPENSIS, CASTELNAU)

4.11

These studies provided accurate retention times on BDS columns for esters of three known multiple-branched fatty acids and one acid tentatively identified as 4,8,12-trimethyltridecanoic acid. The possibility of calculating the retention time of the ester of 4,8,12-trimethyltridecanoic acid was investigated because the three model fatty acids were available for validation of the procedures. The isoprene skeletons of the model fatty acids made this investigation appear to be particularly feasible, since there should be no interaction among the methyl groups.

Data from the literature were used to generate fractional chain length values for single methyl substituents in esters of isomeric monomethyl-branched fatty acids. The addition of fractional chain length values to the basic chain length gave good agreement between calculated and experimental equivalent chain length values for esters of several multiple-branched fatty acids of known structure. The addition was also used to verify the structure tentatively assigned to the ester of 4,8,12-trimethyltridecanoate acid. [33 references]

(Abstract of this article appears under 4.11 page 15 - November 1966)

Haken, J. K. (Univ. New South Wales, Kensington, Australia)
Chemical Abstracts 66, No. 18, 77240y (May 1, 1967)

4.11 RETENTION-TIME RELATIONS IN THE GAS CHROMATOGRAPHY OF THE METHYL ESTERS OF BRANCHED-CHAIN FATTY ACIDS

4.29

Aqueous iodine exhibited both the spectra of tri-iodide ion (λ_{max} = 351 mμ and 287 mμ) and molecular iodine (λ_{max} = 460 mμ). A dispersed aqueous solution of egg lecithin in the same solution of iodine decreased the molecular iodine band at 460 mμ, whereas the tri-iodide ion bands increased. Small amounts of sodium iodide added to the aqueous solution of iodine produced the same reaction.

Because the I_3^- bands are seen for the lecithins in organic solvents, in water, and in the solid state, it appears that the same type of interaction occurs between the lipid and iodine in all three cases. This is noteworthy because of the proposed states of lecithin in the various cases. The micellar form in water and the bilayer leaflet in the solid state are similar, but lecithin dissolved in a nonpolar solvent does not change the dielectric constant; the lecithin behaves as if its polar groups were neutralized. This suppression of the dipole moment possibly indicates some sort of aggregate structure with the polar groups directed toward the interior and the hydrocarbon chains toward the exterior. Iodine, however, seems to react the same with the lecithin in the nonpolar solvent, in the polar solvent, and in the solid state. Because the interaction of iodine and lecithin seems to be similar for a dispersion of lecithin in water and for lecithin in the solid state film, the changes in electrical conductivity that result might come from the complex formation in both cases. If these are charge transfer reactions, electronic conduction should be considered as a possibility in both cases, and the same ideas may apply to oxidized cholesterol.

6.130 NEW SOLVENT EXTRACTION PROCESS REAPS PROTEIN FROM FISH

Swendsen, David L. (Chicago Bridge and Iron Co., Oak Brook, Illinois)
Chemical Engineering 74, No. 8, 176-178 (April 10, 1967)

A process that inexpensively converts 200 tons of fish per day into about 40 tons of defatted fish meal can be located on a ship or on land. Additional processing steps convert the fishmeal into fish protein concentrate (FPC). Instrumental to the success of the process is the combination of solvent extraction and azeotropic distillation to effectively separate water and oil from proteinaceous fish tissue. The extraction step occurs at about 71° C., which is low enough to preserve the full nutritional value of fish proteins. Product yield is high because there is no loss of water-soluble proteins.

Fresh, raw fish is reduced in a grinder; sent to the extractor, which is an agitated tank fitted with heating coils to maintain the correct temperature; and mixed with ethylene dichloride (EDC) solvent. The water removed from the fish forms a heterogeneous azeotrope with the solvent. Distillation of the azeotrope at 71° C. separates the water from the fish oil and prevents formation of a water-oil emulsion. The remaining liquid, an EDC-oil solution called "miscella," is sent to an evaporator and is then filtered. The miscella goes to the oil-recovery system for complete removal of EDC by evaporation and steam stripping. The resulting fish oil is a source of various long-chain fatty chemicals used in the manufacture of paints, plasticizers, and detergents.

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ABSTRACTER: M. F. Tripple

6.32 (*) DETECTION OF L-GLUTAMINYL-L-GLUTAMINYL-L-ALANINE AS DNP-DERIVATIVE IN A BROWN ALGA, ECKLONIA CAVA

Konagaya, Shiro (Tokyo University of Fisheries, Minato-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 5, 417-420 (May 1967)

Eisenine, a tripeptide isolated from two brown algae (Eisenia bicyclis and Ecklonia cava), has the structure L-Pyrglu-L-Glu(NH_2)-L-Ala. Fastigiatine, another tripeptide isolated from brown alga (Pelvetia fastigiata), has the structure L-Pyrglu-L-Glu(NH_2)-L-Glu(NH_2). Although these two naturally occurring peptides have a pyroglutamic acid residue in their structure, they may be the secondary products of the isolation process. Glutamine and glutaminyl peptides are quite labile to slight acidification or heating; they cyclize, respectively, to pyroglutamic acid and pyroglutamyl peptides. Pyroglutamyl peptides can also be produced by selective cleavage of the α,γ-glutamyl peptide.

The author postulated that, if eisenine were present as the corresponding glutaminyl peptide in alga, he could obtain DNP-Glu(NH_2)-Glu(NH_2)-Ala by dinitrophenylation of a cold-water extract of the alga. Using an aqueous extract of Ecklonia cava, he succeeded in obtaining the peptide Glu(NH_2)-Glu(NH_2)-Ala as the DNP derivative. The low yield of DNP-Glu(NH_2)-Glu(NH_2)-Ala may have been caused by incomplete extraction of the glutaminyl peptide from the algal homogenate.

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ABSTRACTER: L. Baldwin

6.31 STRONTIUM-CALCIUM SELECTIVITY OF ALGINATES

Haug, Arne, and Olav Smidsrød (Norwegian Institute of Seaweed Research, Trondheim, Norway)
Nature 215, No. 5102, 757 (August 12, 1967)

There has been considerable interest in the ion-exchange properties of alginates. Inhibition of the uptake of strontium by rats and humans given doses of sodium alginate has been reported; absorption of calcium was not significantly affected. These results were considered to have potential value in connection with therapy of overdoses of strontium 90. The effect of two commercial alginates with different chemical compositions (different ratios of mannuronic and guluronic acid residues in the alginate) on strontium uptake in rats was compared. The alginate with the greater content of guluronic acid residues more effectively reduced the uptake of strontium from the diet.

Alginates rich in guluronic acid have more affinity for divalent metals in the ion-exchange reactions of calcium-sodium, copper-sodium, and barium-sodium than do the more mannuronic acid-rich alginates. In the ion-exchange reaction between calcium and magnesium, alginates rich in guluronic acid have more affinity for calcium than have alginates rich in mannuronic acid.

The potential therapeutic applications of alginates make their calcium-strontium ion-exchange reaction of interest. The ion-exchange properties were

(over)

ABSTRACTER: M. F. Tripple

6.37 THE SUPPLEMENTARY VALUE OF ALGAE PROTEIN IN HUMAN DIETS

Lee, Sunghee Kim, Hazel Metz Fox, Constance Kies, and Richard Dam (Departments of Food and Nutrition, and Biochemistry and Nutrition, University of Nebraska, Lincoln)
Journal of Nutrition 92, No. 2, 281-285 (June 1967)

Because of the high protein content and favorable amino-acid composition of unicellular green algae, these plants have been suggested as a source of food to meet the needs of an ever-increasing human population. Although green alga has a strong bitter taste and an intensive color, both of which make it difficult of acceptance organoleptically, dried alga powder has been found to be acceptable when added to conventional foods in small quantities. The present study was undertaken to determine the supplementary value of alga protein in human diets--that is, the extent to which alga protein is able to replace high-quality proteins from fish, egg, and soybean or to improve low-quality proteins from rice and gelatin. Nitrogen retention was the criterion used in evaluating protein adequacy in this study.

The authors found that algae could replace one-third of the protein of egg and up to two-thirds of the protein of fish without reducing the nitrogen retention of adult human subjects. They believe that this quality suggests the possibility of high-quality food proteins' being extended with alga supplements.

(over)

ABSTRACTER: E. R. Weissman

6.31

determined by dialyzing 2 ml. of 1 percent sodium alginate against 50 ml. of a solution containing a mixture of calcium chloride and strontium nitrate. The ionic strengths of the solutions were 0.66, and the equivalent ratio of the two salts in the solution was chosen to give about equal amounts of the two cations bound to the alginate. The salt solution was changed three times, and the alginate gels were dialyzed thoroughly against distilled water and against 0.1 normal hydrochloric acid. The amount of the two cations in the combined acid dialyzates was determined by atomic absorption. Results were calculated as the selectivity coefficient using $k \frac{Sr}{Ca} = \frac{Sr_g\ Ca_l}{Ca_g\ Sr_l}$, where Ca_l and Sr_l refer to concentrations in the original salt solution and Ca_g and Sr_g refer to concentrations in the acid dialyzates. Two alginate samples prepared from Laminaria digitata (Huds.), one containing 61.5 and the other 68 percent mannuronic acid, and two samples prepared from the stipes of L. hyperborea (Gunn), one containing 30.5 and the other 27.5 percent mannuronic acid, were used.

Correlation between the selectivity coefficients and the composition of the uronic acid of the alginates was quite clear and indicated that the strontium selectivity of the alginates was caused by their content of L-guluronic acid residues. A polyguluronic acid would seem to be the alginate preparation with the most selectivity for strontium as compared to calcium. [12 references]

6.37

Partial replacement of rice protein by alga protein improved the protein quality of the rice. The nitrogen balance achieved with a diet providing 6 grams nitrogen (two-thirds rice and one-third alga) was +0.68 g. per day compared with a balance of -0.01 g. per day when the equivalent amount of nitrogen was provided by rice alone.

Alga is a good source of lysine and threonine and would be expected to improve the protein quality of cereals, since cereals are generally deficient in these amino acids. It has been shown that the addition of lysine and threonine improves the protein quality of rice. The authors could not explain why algae did not improve the protein quality of soybeans. Alga combined with gelatin was not more effective than alga alone because of the gross amino-acid deficiencies in gelatin.

One of the most undesirable characteristics of alga protein is its low digestibility. In the present study, the lowest digestibility coefficient (66 percent) was recorded in response to feeding 6 g. nitrogen from algae alone and the highest (82 percent) was obtained when the subjects were fed 6 g. nitrogen from egg alone. When alga was fed together with other proteins, higher (71 to 75 percent) digestibility coefficients were obtained. The authors suggest that alga is utilized more efficiently when fed in small quantities or when fed in combination with proteins of higher digestibility than when fed alone.

6.130 (Cross Reference: 6.54)

Because the water and oil are continually removed in the extractor, the density of the ground fish tissue increases and eventually exceeds the density of EDC. The proteinaceous fish solids drop to the bottom of the vessel and are conveyed to three rotary steam-jacketed vacuum driers that evaporate residual EDC solvent. The defatted fishmeal is then ground, screened, and stored.

About 100 lb. of raw fish are required to produce 20 lb. of fishmeal. The amount of fish oil produced will vary according to the type of fish used. The protein content of the meal will also vary, although it is normally in excess of 70 percent. The meal is a high-quality, nutritive product that is used as animal feed. When the bone content is reduced and the meal is ground to a flour and deodorized with isopropyl alcohol, the resulting fish protein concentrate is fit for human consumption.

Cost of the fish and the number of operating days a year are two factors having a major effect on the manufacturing cost of the process. Ideally, a plant should be located near the supply of fish so that the boats can fish and return in the same day with a capacity load, thereby reducing the cost per ton of fish to an economical level. The obvious choice for a plant facility is a barge, and the facility for solvent extraction can be placed on a standard barge as a complete processing unit with power- and steam-generating equipment. The steel construction of the barge lends itself to the fabrication of compartments that reduce the cost of storage tanks and reduce the tanks' requirements for floor space.

6.32

The results suggest that eisenine obtained from Eisenia bicyclis and fastigiatine from Pelvetia fastigiata might be derived from the corresponding glutaminyl peptides. They also suggest the presence of a prolyl peptide and some unidentified amino acid, as well as the fact that the pyrolidone ring in eisenine is formed during isolation from the N-terminal glutaminyl residue in the peptide.

6.32 STUDIES ON THE NUCLEOTIDES AND THEIR RELATED SUBSTANCES IN DRIED LAVER

Fujii, Yutaka (Tokai Regional Fisheries Research Laboratory, Chuo-o-ku, Kachidoki 5-5, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 5, 453-461 (May 1967)

The perchloric acid extract of dried laver was fractionated, and the fractions obtained were analyzed for nucleotides. Cytidylic acid, adenylic acid, uridylic acid, and guanylic acid were the main nucleotides found. Small amounts of diphosphate, triphosphate, nucleosides, and free bases were also detected. Most of the nucleotides were in the form of 2'- or 3'-nucleotides; the sugar component was ribose. Since the concentration of nucleotides in dried laver ranged from 37 to 85 μmoles per gram of dried laver, the author concludes that laver is one of the foods richest in nucleotides. [Abstracter: L. Baldwin]

6.54 THE FISH PROTEIN CONCENTRATE STORY

Snyder, Donald G., and E. R. Pariser (Bureau of Commercial Fisheries Technological Laboratory, College Park, Maryland), and Wilbert McLeod Chapman (Division of Resources, Van Camp Sea Food Company, Division of Ralston Purina Company, San Diego, California)
Food Technology 21, No. 7, 70-72 (July 1967)

I - ENTER: FPC, by D. G. Snyder.

Protein malnutrition presently affects over one-half of the world's population. There are enough fish in the sea to supply the annual total animal protein needs of up to 30 billion people; however, only 10 percent of the annual potential of marine fish is currently being harvested. Vegetable produce, which is the principal source of proteins and calories, requires supplementation with animal protein to ensure adequate nutrition. In 40 out of 60 developing countries, per capita production of agricultural products is decreasing. An animal protein is needed in large quantities and at low cost. It must be stable at room temperature, retain a high nutritional value, and be available in a form that can be readily incorporated into a variety of food products. Fish protein concentrate (FPC) hygienically prepared from fish meets these requirements in that it is an inexpensive, stable, wholesome product of high nutritive quality.

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 ABSTRACTER: M. F. Tripple

7.591 (*) KINETIC STUDIES OF DOGFISH LIVER GLUTAMATE DEHYDROGENASE WITH DIPHOSPHOPYRIDINE NUCLEOTIDE AND THE EFFECT OF ADDED SALTS

Corman, Leonard (Tufts University, School of Medicine and Dentistry, Department of Pharmacology, Boston, Massachusetts), and Nathan O. Kaplan (Graduate Department of Biochemistry, Brandeis University, Waltham, Massachusetts)
Journal of Biological Chemistry 242, No. 12, 2840-2846 (June 25, 1967)

Kinetic studies were performed with crystalline glutamate dehydrogenase from dogfish liver using the diphosphopyridine nucleotides as cofactors. The kinetic constants for the various substrates were determined. The glutamate dehydrogenase was similar to enzymes derived from other vertebrates in its sensitivity to guanosine-5'-triphosphate, adenosine 5'-diphosphate, and excess reduced diphosphopyridine nucleotides. Inhibition of the initial rate of the animating reaction by excess reduced diphosphopyridine nucleotide was decreased by adding increased ammonium chloride to the reaction mixture. The reduction of inhibition was attributed to the chloride ion.

A number of anions were tested for their effectiveness in preventing inhibition by excess reduced coenzymes. The order of their effectiveness followed the Hofmeister series of ClO_4^- > SCN^- > I^- > Br^- > Cl^- > F^-. Peak effectiveness was seen at comparatively low concentrations of salts that varied from 0.045 M ClO_4^- to 0.25 M Cl^-. A further increase in salt concentration resulted in a progressive decrease in the rate of reaction. Concentrations of salts that were effective in

*Items on back of card. (over)

 ABSTRACTER: M. F. Tripple

6.84 (*) PEARLESCENT EFFECTS IN COSMETICS

Stout, William C.
Drug and Cosmetic Industry 100, No. 3, 44-45, 173-174 (March 1967)

The first pearl essence to be used in the production of cosmetics was guanine (2-amino-hypoxanthine), which is a natural secretion of the air bladders of fish. In some species of fish, this natural secretion coats the scales, and its crystalline structure and high index of refraction cause it to reflect incident light. This provides an unusual example of protective camouflage in nature because predator fish confuse this reflection with the play of light on waves or ripples.

A French fisherman discovered the commercial value of guanine by accident. He noticed that the beads of his rosary were becoming pearlized from frequent handling because the guanine on his fingers became attached to the rosary. The way to remove the pearl essence was to use a solution of ammonia water. This incident is purported to be the beginning of a new industry.

The natural pearl, or guanine, is nontoxic; it is a purine and therefore decomposes if the fragile crystals are not completely freed from fats, oils, and protein hydrolyzates. This is particularly true of Japanese guanine, which is scraped from the skin rather than the scales of a flat eellike fish called the hairtail. The fish residue in the guanine often becomes rancid, darkens, and emits a foul odor.

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 ABSTRACTER: M. M. Gwin

7.592 (*) CHANGES OF THE MUSCLE PIGMENT IN TUNA ON COOKING

Koizumi, Chiaki (Tokyo University of Fisheries, Minato-ku, Tokyo, Japan), and Fumio Matsuura (Faculty of Agriculture, the University of Tokyo, Bunkyo-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 7, 651-656 (July 1967) (In Japanese, English summary)

Sodium hydrosulfite and nicotinamide were added to cooked tuna meat and the resulting absorption spectra were determined with a spectrophotometer equipped with an opal glass apparatus. Addition of sodium hydrosulfite caused the meat to become intensely pink. The absorption spectrum at this point was essentially that of ferrohemochrome. When nicotinamide was added (following the addition of sodium hydrosulfite), the spectrum assumed a shape typical of the ferrohemochrome spectrum. This result would point to an additional formation of ferrohemochrome in the tuna meat.

The spectrum of heat-denatured myoglobin approached that of ferrohemochrome only after the myoglobin had been treated with both sodium hydrosulfite and nicotinamide. Therefore, the authors concluded that heated myoglobin is converted not to a denatured globin hemochrome but to a pigment. This pigment seems to correspond to the "metmyochromogen" reported by Tarladgis in 1962. In metmyochromogen, the fifth and sixth coordination positions are occupied by denatured globin and water molecules.

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 ABSTRACTER: M. M. Gwin

HISTORY OF FISH PROTEIN CONCENTRATE

PEARL ESSENCE FROM FISH

STUDIES OF DOGFISH LIVER GLUTAMATE DEHYDROGENASE

PIGMENTARY CHANGES IN COOKED TUNA

6.84

The Canadian Maritime provinces of New Brunswick and Nova Scotia, and an area of the Maine coast down to Eastport, produce natural pearl of the finest quality. Guanine from Morocco and Yugoslavia is a deep metallic brown; guanine from Norway and Sweden is very white. Because of the variations in quality and color, there is the problem of price fluctuations, with high-quality pearl essence commanding higher prices. As is true with most commodities, the price is also dependent on supply and demand.

The migratory habits of certain species of fish having fine pearl essence are uncertain, and no one can predict where and when these fish will appear. This means producers will have to duplicate their facilities in areas where the fish appear. Climatic changes as the fish migrate also tend to affect the quality of guanine. Current prices ranging from $12 to $20 per pound for an 11 percent suspension are the results of these problems; it is no wonder that manufacturers began looking for an artificial substitute for the natural guanine. A suggested substitute compound is bismuth oxychloride, which forms platelets of high luster when produced under controlled conditions. However, natural guanine is normally used in nail polishes because stable suspensions of the heavy bismuth oxychloride crystals are extremely difficult to obtain.

Anonymous
Chemical Abstracts 63, 10181a (October 11, 1965)

6.84 IRIDESCENT CAKES OF SOAP

6.54

II - THE DEEP YARN OF FPC, by E. R. Pariser.

Fish spoil more rapidly than do other protein foods; the procedures developed to inhibit the growth of microorganisms and the autolytic breakdown of fish tissues have been limited in number. The use of fish has been restricted by the problems of preservation, storage, and distribution. New concepts of fish utilization must be developed; the use of fish as a rich additive to other foods is such a concept.

The idea of producing concentrates from fish for human consumption is not new; it dates back to early Roman history. A product called liquamen may be considered the prototype FPC. Although manufacture of liquamen was one of the few large-scale food-processing industries in Rome, the art was lost in post-Roman times. In Asia, the manufacture of FPC in the form of fish sauces and pastes that were similar to liquamen was developed centuries ago. The first mention of a product similar to FPC in America was in 1629; however, another 250 years were to pass before new developments in FPC occurred.

III - FISH CATCH FOR FPC, by W. M. Chapman.

The ocean can be expected to yield some 2 billion tons of fish annually, but the current world oceanic catch is barely more than one-fiftieth of this potential. The problem is how to get the protein out of the ocean and into food for human consumption. The solution has centered around creation of a low-cost concentrate that meets human hygiene standards but does not do damage to the proteins. With this solution, the major part of the ocean's productivity that is not unsuitable for human consumption could be eaten by humans. If a dried, defatted, odorless, and tasteless protein powder could be undetectably mixed into foods during their preparation, the foods would acquire an adequate amino-acid balance with no increase in cost. It is in this area that FPC holds great promise.

IRIDESCENT SOAP

7.592

The authors concluded that the pink color of cooked tuna is due to a mixture of metmyochromogen and hemochrome, which coordinates the denatured globin and the nitrogenous base that is inherent in the meat. The pink color of cooked tuna, then, can be improved by adding nitrogenous bases and reducing agents to the meat, causing an additional formation of ferrohemochrome from the metmyochromogen.

7.593 ISOLATION OF 2,6-DIBROMOPHENOL FROM THE MARINE HEMICHORDATE, BALANOGLOSSUS BIMINIENSIS

Ashworth, Raymond B., and Milton J. Cormier (Department of Biochemistry, University of Georgia, Athens 30601)
Science 155, No. 3769, 1558-1559 (March 24, 1967)

The luminous marine enteropneust Balanoglossus biminiensis, or acorn worm, lives in intertidal waters along the coast of the southern United States. The compound 2,6-dibromophenol was isolated from this hemichordate. This compound, which is responsible for the characteristic iodoformlike odor of these animals, is present in large amounts estimated at 10 to 15 milligrams per organism. The identity of the isolated compound was determined by analyses of ultraviolet, infrared, and nuclear magnetic resonance spectra; by mass spectrometry analysis, and by analysis of melting-point data. [Abstracter: M. M. Gwin]

7.591

preventing inhibition by excess reduced diphosphopyridine nucleotide depressed activity at noninhibitory levels of the coenzyme. Added salt did not affect the calculated maximum velocity of the reaction, but it did increase the apparent K_m for the diphosphopyridine nucleotide and effectively prevented inhibition of high concentrations of the cofactor. The presence of added salt minimized the regulatory influence of guanosine 5′-triphosphate and adenosine 5′-diphosphate.
[12 references]

7.591 CHROMATOGRAPHIC ANALYSIS OF THE PROTEOLYTIC ENZYMES OF THE SEA URCHIN EGG. II - GEL FILTRATION OF EXTRACTS FROM UNFERTILIZED AND FERTILIZED EGGS AND INVESTIGATIONS OF THE CATHEPTIC ACTIVITY

Lundblad, Gunnar, Martianne Lundblad, Janis Immers, and Walter Schilling (Natl. Bacteriol. Lab., Stockholm, Sweden)
Chemical Abstracts 65, 17283f (November 21, 1966)

7.591 NUCLEOSIDASE OF OCTOPUS VULGARIS

Farina, B., E. Mezzasoma, and E. Leone (Univ. Perugia, Italy)
Chemical Abstracts 66, No. 15, 62083a (April 10, 1967)

ODOR-PRODUCING COMPOUND FROM A HEMICHORDATE

ANALYSIS OF ENZYMES FROM SEA URCHIN EGGS
NUCLEOSIDASE FROM OCTOPUS HEPATOPANCREAS

7.773 (*) ELIMINATION OF CONTAMINANTS DURING THE ISOLATION OF FATTY ACID ESTERS BY PREPARATIVE GAS-LIQUID CHROMATOGRAPHY

Raju, P. K., and Raymond Reiser (Department of Biochemistry and Biophysics, Texas A and M University, College Station)
Lipids 2, No. 2, 197-198 (March 1967)

The isolation of pure fatty acids by preparative gas-liquid chromatography (GLC) is complicated by the presence of traces of acids previously analyzed, even though the chromatogram may show clear separations. The presence of these traces becomes a major problem in radioactive tracer studies in which the contaminating fatty acid may have a high degree of radioactivity. Rechromatography does not remove all the contaminating materials completely.

In some laboratories, the usual procedure for the isolation of fatty acids is first to isolate groups of acids of common carbon numbers by GLC on a nonpolar liquid phase and subsequently to separate the groups into acids of differing degrees of unsaturation by silver-ion thin-layer chromatography. As is the case with individual fatty acids, the groups of common carbon-number acids are usually contaminated with the preceding group.

The difficulty encountered in the isolation of pure fatty acids by GLC is probably due to traces of the previously analyzed acids that remain in the outlet

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ABSTRACTER: M. F. Tripple

7.80 (*) COMBINED EXTRACTION AND PAPER CHROMATOGRAPHY OF FOOD PRESERVATIVES

Rajama, J., and P. Mäkelä (Laboratory for Food Research and Technology, The State Institute for Technical Research, Otaniemi, Finland)
Journal of Chromatography 29, No. 2, 369-377 (August 1967)

If a foodstuff is applied directly to the paper during the chromatographic separation of food preservatives, food components will interfere with the migration and, by masking the spots on the chromatogram, make the migration difficult to interpret. To avoid these difficulties, the analyst usually makes a preliminary extraction before he performs the paper chromatography of ether-soluble preservatives. A large number of extraction funnels and items of glassware are needed for the extraction if several analyses are to be made simultaneously. Emulsions are easily formed and can make the funnel extraction of fruit juices and jellies difficult. The purpose of this study was to obtain a remedy for these difficulties.

The well-known effect of compounds' migrating with the solvent front if the solvent is too powerful is the basis of the method. (This phenomenon can be regarded as a type of extraction on paper, since it permits the direct separation on chromatographic paper of ether-soluble compounds from interfering substances. The procedure is simple, rapid, and does not require complicated apparatus. The extracting solvent concentrates the preservatives in a narrow line, which is well

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ABSTRACTER: M. F. Tripple

7.80 (*) CONDUCT OF TASTING TESTS

Christie, E. (C.S.I.R.O., Division of Food Preservation, North Ryde, New South Wales, Australia)
Food Technology in Australia 14, Nos. 2, 3, and 4 (1962)
World Fisheries Abstracts 16, 45-46 (January-March 1965)

The following extract summarizes a lecture given at the University of New South Wales on the taste evaluation of foods.

Following comments on the difference in consumer tests and laboratory-administered taste tests, the lecturer described the working conditions in several laboratories and analyzed various test operations--utensils, preparation of test samples, and temperatures used. Samples were evaluated as to size, fatigue standard procedures of cooking were examined, and preparations other than cooking were considered. He then discussed the tests themselves and the panelists who took them.

He pointed out that the time of day when taste tests are administered are of importance. In general, morning tests are preferred; they should be given at a time not too close to meals. Meat tasters seem to perform better when they are slightly hungry. The duration of the sessions and the time between samples was also discussed, as well as the order of presentation of samples and reference standards used.

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ABSTRACTER: L. Baldwin

8.42 ZINC CONCENTRATIONS OF FAST AND SLOW CONTRACTING MUSCLES IN THE LOBSTER

Bryan, G. W. (Marine Biological Association of the United Kingdom, The Laboratory, Citadel Hill, Plymouth, England)
Nature 213, No. 5080, 1043-1044 (March 11, 1967)

During a study on the regulation of zinc in the lobster Homarus vulgaris, the researchers found that different skeletal muscles contained different amounts of zinc. The main flexor muscle from the abdomen of the lobster contained 14.4 micrograms of zinc per gram of muscle, whereas pooled samples of the extensor and flexor muscles of the coxopodite segments of the walking legs contained 60 µg. per g. Analyses of muscles from other decapod crustaceans suggested that a low concentration of zinc is characteristic of muscles that can quickly contract. To confirm this suggestion, the authors compared muscles having certain structural differences to see if their methods of functioning were also different.

Some of the components of the dorsal musculature in crustaceans have a coarse striation and other components have a fine cross striation. The two types of striations may form two different systems--one for slow contractions and the other for fast contractions. The muscles from lobsters show the same types of striations. The superficial and deep extensors and flexors of the abdomen and the three dorsal thoracico-abdominal muscles of the lobster were analyzed. The supposition that muscles with coarse and fine striations differ in their mode of

(over)

ABSTRACTER: M. F. Tripple

ISOLATION OF FATTY ACID ESTERS

CONDUCT OF TASTE TESTS

CHROMATOGRAPHY OF FOOD PRESERVATIVES

CONCENTRATIONS OF ZINC IN LOBSTER MUSCLES

7.80

The composition of the taste panels was discussed in great detail, inasmuch as personnel may have variable qualifications, either as a result of inherited characteristics or as a result of training, experience, or motivation. The availability and health of the tasters are also important considerations. The procedure for the selection and training of a panel, the training of the tasters, their briefing before the test, the tasters' programs, the attendance of tasters, and the planning and organization of tests were surveyed. Rating methods and criteria relating to analytical panels were also described.

The lecturer implied that the rules he described have become a matter of tacit acceptance in most food-taste laboratories.

7.80 MEASUREMENT OF HYPOXANTHINE CONCENTRATION IN CANNED HERRING AS AN INDEX OF THE FRESHNESS OF THE RAW MATERIAL, WITH A COMMENT ON FLAVOUR RELATIONS

Hughes, R. B., and N. R. Jones
Journal of the Science of Food and Agriculture 17, No. 9, 434-435 (September 1966)

(Abstract of this article appears under 7.87 page 19 - May 1967)

8.42

contraction was confirmed by demonstration of the presence of slow and fast systems in both the dorsal and ventral musculature of decapod crustacea.

Results of analyses of zinc from muscles of three different lobsters supported the idea that fast muscles contain less zinc than do slow muscles. Slow muscles contained five to seven times as much zinc as did the fast muscles and twice as much zinc as did any other lobster tissue. Previous investigations had suggested that the permeability to zinc of the main flexor muscle is low because virtually no increase in the concentration of zinc in the muscle occurred when the amount of zinc in the blood was raised by a factor of six. No specific attempt was made to measure the permeability to zinc of the lobster muscles. An indication of the permeabilities of slow and fast muscles, however, was obtained by measuring the concentrations of zinc-65 in lobsters that had been kept in sea water to which this isotope had been added. The concentrations of zinc-65 were expressed as muscle-to-blood ratios and were compared with the corresponding stable zinc ratios. Muscle-to-blood ratios for zinc-65 in slow muscle were roughly double those for fast muscle, which suggested that slow muscle is more permeable to zinc. The stable zinc ratio for slow muscle was higher than that for fast muscle. It would presumably take longer for the zinc-65 ratio for slow muscle to approach that for stable zinc.

The difference between the concentrations of zinc in fast and slow abdominal muscles of the lobster and of other decapod crustaceans is a feature that should make these muscles more suitable as material for the determination of the role of zinc in the crustacean muscle. [12 references]

7.773

tubes. This problem can be solved by injecting from 10 to 15 microliters of hexane at such a time that the peak caused by the hexane appears just before the peak of the acid to be collected.

The following example shows the efficiency of the proposed technique for decontamination. Methyl esters of endogenous fatty acids of adipose tissue triglycerides from rats were separated and collected. Analysis of the 18-carbon acid ester fraction by an analytical gas chromatograph equipped with a flame ionization detector showed the presence of palmitate and palmitoleate. When the preparative equipment was injected with 10 µl. of hexane after the emergence of C-16 group but before the C-18 fraction, the analytical chromatogram of the C-18 group contained no peaks representative of the C-16 acids.

7.773 GAS CHROMATOGRAPHIC FAT INVESTIGATIONS

Woldich, H.
Nahrung 9, No. 2, 247-251 (1965) (In German)
Abstracts from Current Scientific and Technical Literature 18, Abstract No. 1464, p. 280 (July 1965)

The author points out that today gas chromatographic investigations of fatty acids can be carried out in series, preferably by direct reesterification of the fat to the methyl ester. A detailed description of the method is presented.

7.80

suited as a starting line for chromatography on the same paper. Some preservatives can be separated quickly and efficiently during the course of the extraction with the help of arresting reagents. A modification of the method was developed for use on fat-containing foods.

Food preservatives--sorbic, benzoic, and p-hydroxybenzoic acids and p-hydroxybenzoates--were directly extracted from foods onto chromatographic paper with ethyl ether. Paper chromatographic separation of the extracted compounds was done on the same paper. Methyl, ethyl, and propyl p-hydroxybenzoates were separated from each other during ether extraction and from the critical pair; the butyl and benzyl p-hydroxybenzoates were separated on a paper impregnated with sodium hydroxide. An examination was made of the reactions that distinguish sorbic and benzoic acids when both are present.

7.80 ANALYSIS OF FOOD ADDITIVES.
VIII - DETERMINATION OF NITRITE IN FISH SAUSAGE

Kanno, Saburo, Yutaka Wada, Tadayoshi Nakaoka, Kiyoko Kawana, and Yukiko Hasegawa
(Kanagawa Prefect. Public Health Lab., Yokohama, Japan)
Chemical Abstracts 65, 12772h (October 10, 1966)

FAT INVESTIGATIONS BY GAS CHROMATOGRAPHY

DETERMINATION OF NITRITE IN FISH SAUSAGE

9.11 WEATHER OF THE SEA
(*)

Tully, John P. (Fisheries Research Board of Canada, Ottawa)
Western Fisheries 74, No. 2, 62-64, 66, 75, 89, 99, 109 (May 1967)

The prerequisites for life include solar energy, water, carbon dioxide, oxygen, fertilizer elements, catalysts, the elements of life itself, and moderate temperature limits. All these requirements are met in the waters of the earth. Bodies of water, such as oceans or lakes, may be considered as bowls full of water. The properties of these bodies of water can only be changed by processes working on the surface of the water, such as heating, cooling, precipitation, evaporation, or freezing. These processes, which are functions of atmospheric weather and climate, have profound effects on oceanographic conditions. Fish generally prefer a particular set of oceanographic conditions and tend to move in response to changes in these conditions. An explanation is offered of some of the major oceanographic conditions and the reaction of fish to these conditions.

Surface water may be mixed vertically by wind actions or convection or moved horizontally by tides or currents. The water closest to the surface reacts most quickly to atmospheric conditions. Deeper water reacts more slowly until a depth is reached where surface conditions have no effect. The zone of transition between the surface water and the deeper water is called the "thermocline" and marks the lower boundary of surface processes. It also acts as a barrier to aquatic life. Aquatic plants live above the thermocline and dead organic matter tends to float on the thermocline, so plankton and upper zone fish concentrate to feed there.

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ABSTRACTER: E. R. Weissman

9.15 EFFECTS ON WILD YOUNG SALMON OF SPRAYING DDT OVER NEW BRUNSWICK FORESTS

Elson, P. F. (Fisheries Research Board of Canada Biological Station, St. Andrews, New Brunswick)
Journal of the Fisheries Research Board of Canada 24, No. 4, 731-767 (April 1967)

This report discusses the comparative abundance of wild young salmon observed in New Brunswick streams both before and after various types of spray treatment with DDT that occurred from 1952 to 1962. When DDT (dichlorodiphenyltrichloroethane) mixed with oil was sprayed over large tracts of New Brunswick forest, some of the insecticide entered drainage systems lying in the spray zones. As a result, many young salmon were killed and the salmon stocks were endangered.

Most New Brunswick salmon spend 3 years in the rivers before migrating to sea as smolts. These young fish can be conveniently divided into three size groups: (1) underyearlings, (2) small parr that are over 1 year old but are 10 centimeters or under from tip of snout to tip of extended tail fin, and (3) large parr. The size groups are roughly comparable to each year of age. Wild young salmon in sprayed and unsprayed streams were assessed for numbers in each size group. The abundance of each group was expressed as population index = average number of fish per 100 square yards of stream bottom.

(over)

ABSTRACTER: M. F. Tripple

9.11 WEATHER OF THE SEA. PART 2.
(*)

Tully, John P. (Fisheries Research Board of Canada, Ottawa)
Western Fisheries 74, No. 3, 36, 38-43 (June 1967)

In part I, the author described some of the basic oceanographic factors affecting the behavior of fish and the major features of two ocean regions: the Tropics and the Subtropics. In this article, the author describes the Subarctic and Arctic Ocean regions, and the Pacific salmon fishery. The subarctic regions of both the Atlantic and Pacific Oceans are characterized by a large input of fresh water from precipitation and land drainage. In the Atlantic, the only means of replenishing the supply of nutrients in the surface waters is by winter overturn, when temperature changes cause the bottom and surface water to change relative positions. Therefore, the surface waters of the Atlantic are relatively barren of nutrients and the pelagic fisheries are mostly limited to herring. Bottom fisheries on the large banks below the thermocline are, however, particularly rich. In the subarctic Pacific, there is no lack of surface nutrients and the pelagic fishery is excellent.

The subarctic and arctic regions of the Pacific Ocean are the dwelling place of the Pacific salmon, which live wherever there is a halocline and the waters are warm enough. The author describes the complex migration pattern of the Pacific salmon and the way in which movement of these salmon is strongly affected by oceanographic conditions in these waters. The major ocean currents and their effect on oceanographic and fishery conditions are described.

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ABSTRACTER: E. R. Weissman

9.15 EFFECTS OF FOREST SPRAYING WITH DDT IN NEW BRUNSWICK ON FOOD OF YOUNG ATLANTIC SALMON

Keenleyside, Miles H. A. (Fisheries Research Board of Canada Biological Station, St. Andrews, New Brunswick)
Journal of the Fisheries Research Board of Canada 24, No. 4, 807-822 (April 1967)

Young Atlantic salmon in fresh water feed mainly on immature, aquatic stages of insects, particularly Ephemeroptera, Trichoptera, and Diptera. Many of these insects are killed when DDT (dichlorodiphenyltrichloroethane) is sprayed on forests and subsequently enters the rivers in which the insects live. After repeated spraying, some species of insects do not return to abundance for several years. Young salmon are also susceptible to poisoning by very low concentrations of DDT in water. It has been shown that several species of fresh-water fish are killed by ingesting DDT with their food. Repeated aerial applications of DDT since 1952 to control an outbreak of spruce budworm in New Brunswick affected resident young salmon directly through toxic action and indirectly by altering their food supply.

In the Miramichi River in New Brunswick, most young salmon spend 3 years in fresh water before going to sea. The effects of the 1954 DDT spraying on food of young salmon in the Northwest Miramichi River were studied by comparing stomach contents of fish caught in the same parts of the river in 1953 and 1955. The food of fish captured in 1955 was compared with aquatic insects collected during the same year inside and outside the 1954 spray zone. Changes in insect fauna were reflected in altered diets of the young salmon.

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ABSTRACTER: M. F. Tripple

REACTION OF FISH TO TROPIC OCEAN CONDITIONS

REACTION OF FISH TO ARCTIC OCEAN CONDITIONS

EFFECTS OF DDT SPRAY ON WILD YOUNG SALMON

EFFECTS OF DDT SPRAY ON FOOD OF YOUNG SALMON

9.11

Fish are creatures of their environment and, as such, are sensitive to the behavior of the water. Each species of fish has its own preferred region, domain, and water mass. The author concludes that a foreknowledge of oceanographic conditions and a knowledge of the reaction of fishes to these conditions will enable fishermen to locate fish with a minimum of hunting time and catch them economically. The United States tuna fishermen, the Norwegian herring fishermen, and the Japanese have been making good use of combined oceanographic and biological knowledge for many years.

The author further concludes that production of life is a nondestructive use of water; today there is a constant competition between destructive and nondestructive uses of water. He believes that the destructive use of water--that is, use by which it becomes polluted, impounded, or dispersed--is shortsighted. Preservation of fresh and salt waters as producers of life should rank high in considerations of a national water-use policy.

Holm-Hansen, Osmund, and Charles R. Booth (Univ. of California, La Jolla)
Chemical Abstracts 66, No. 10, 40629f (March 6, 1967)

9.11 MEASUREMENT OF ADENOSINE TRIPHOSPHATE IN THE OCEAN AND ITS ECOLOGICAL SIGNIFICANCE

9.11

Along open ocean coast, wind action dominates the behavior of the water. If the winds blow water offshore, water rises from the depths to replace it. This "divergence" or "upwelling" commonly occurs in the lee of islands and along many coasts. Where it occurs, the aquatic plants bloom, the zooplankton grow, and pelagic fish gather to feed. Areas of divergence are therefore fishing areas and account for the fisheries off the coast of California, Spain, Africa, India, and Norway. The condition is not always good for fisheries because it can change the condition of bottom waters near the coast and most bottom fish are sensitive to temperature changes and will move from the area.

The opposite condition, "convergence" or "downwelling," occurs when offshore winds drive surface waters on shore, deepening the surface layer and creating strong alongshore currents. These conditions develop fairly rapidly and water conditions change equally rapidly. It is therefore necessary for the fisheries oceanographer to know what the particular climatological conditions of an area are and the effects of these conditions on fishing.

Ogura, N., and T. Hanya (Univ. Tokyo, Japan)
Chemical Abstracts 66, No. 10, 40630z (March 6, 1967)

9.11 NATURE OF ULTRAVIOLET ABSORPTION OF SEAWATER

9.15

The present paper describes changes in the food of young salmon collected between 1953 and 1961 in the Northwest Miramichi River, an area sprayed with DDT several times during that period. Comparisons had been made between food organisms found in fish stomachs and the aquatic insect fauna living in areas where the fish were collected.

Food in the stomachs of young Atlantic salmon in the study area changed after aerial DDT spraying of the surrounding watershed. Before spraying, the young salmon typically ate immature aquatic insects; the fry (underyearlings) concentrated on Diptera and small Ephemeroptera, and the parr (overyearlings) concentrated on Diptera, Trichoptera, and all sizes of Ephemeroptera. A reduction in numbers of all aquatic insects caused by DDT spraying was immediately followed by a resurgence of Chironomidae and other Diptera. Surviving fry fed heavily on these insects; parr fed on Diptera but also ate snails, worms, and fish, which were previously unimportant in their diet. Five years after the last spraying of DDT, the prespray complexity of food eaten by the young salmon was again being approached. Trichoptera were the slowest of the major fish-food insects to reappear in the stomachs of young salmon. Ephemeroptera were relatively more abundant in the fry stomachs than in the surrounding stream fauna; Ephemeroptera and Trichoptera were more abundant in parr stomachs. The greater availability of these insects and active selection by the fish are possible causes of these relations. [17 references]

9.15

After the DDT was applied at a concentration of ½ lb. per acre, the young salmon of all size groups were found in noticeably low numbers as compared with the numbers in unsprayed populations. Underyearlings were only 2-10 percent as abundant; the population index was reduced from 24 in places not affected by spray to less than 1 in most sprayed areas. The small parr were only 30 percent as abundant, and the index was reduced from 20 to 6; the large parr were only 50 percent as abundant, and the index was reduced from 12 to 6. After applications at a concentration of ¼ lb. per acre, underyearlings were only about 50 percent as abundant as with no spraying, small parr were about 80 percent as abundant, and large parr were hardly affected. Spraying twice with DDT at ¼ lb. per acre resulted in low numbers of underyearlings, similar to those numbers seen after a single application of DDT at ½ lb. per acre. No equivalent data were available for parr after two sprayings of DDT at ¼ lb. per acre, but effects similar to a single spraying of DDT at ½ lb. per acre are indicated.

The downstream transport of the DDT-in-oil mixture was an important factor in extending the harmful effects of the insecticide to 30 miles or more below the spray zones. A delayed mortality associated with the onset of winter cold occurred 4 to 6 months after the initial mortality. The delayed mortality may have affected a large proportion of parr that had survived early mortality; however, quantitative measurements of this factor were not made on the wild populations. Reductions in numbers of young salmon were followed by declines in numbers of adults taken in the fisheries and returning to the river as spawners. When no spraying was done in subsequent years, the promptness of recovery of young salmon populations depended primarily on abundance of the parent stock. [44 references]

9.15 EFFECTS ON AQUATIC INSECTS OF FOREST SPRAYING WITH PHOSPHAMIDON IN NEW BRUNSWICK

Grant, C. D. (Fisheries Research Board of Canada Biological Station, St. Andrews, New Brunswick)
Journal of the Fisheries Research Board of Canada 24, No. 4, 823-832 (April 1967)

It has been shown that aerial spraying of forests with insecticides seriously reduces the populations of aquatic insects. A spruce budworm epidemic in New Brunswick led to extensive aerial spraying of forests with DDT (dichlorodiphenyltrichloroethane). This report deals with a study of the effect on aquatic insects of phosphamidon, which was one of the insecticides tested to alleviate side effects.

The following three methods used in earlier studies on DDT were used to study the effects of phosphamidon on the aquatic insects. (1) Surber bottom samples--prespray and postspray collections of the bottom organisms were made with a Needham-Surber foot-square bottom sampler. (2) Emergence cages--emerging aquatic insects were collected in cage traps. (3) Drift screens--foot-square copper screens were set vertically on the stream bed to catch aquatic insects drifting down the stream.

Surber-bottom samples.--The results of three series of bottom samplings, one prespray series, and two postspray series showed no reduction in the number of

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 ABSTRACTER: M. F. Tripple

9.2 RISING IMPORTS BOOSTED U.S. SUPPLY

Power, E. A. (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)
Fishing Gazette Annual Review Number 82, 19, 123, 133-135 (November 1, 1965)

The U.S. supply of fish and shellfish, including the domestic catch and imports, was a record 12 billion pounds in 1964. This amount was 573 million pounds above the 1963 figure and 4.2 billion pounds above the 1956-60 average. The reason for the increase was a substantial rise in the amount of imports of both edible and industrial fishery products. These imports made the difference, inasmuch as the domestic catch declined sharply and was the smallest since 1953.

The United States has about 6 percent of the world population, yet it produced and imported about 12 percent of the world catch of fish during 1964. This amount of trade in 1964 means that the United States continues to lead all other countries in the volume and value of fishery-product imports. The U.S. volume of imports was much higher than that for second-place West Germany and third-place England. The value of U.S. imports, estimated at $525 million, was over double that of any other country.

In 1964, over half the U.S. supply of fish and shellfish was of foreign origin. Imports contributed 71.3 percent to the supply of industrial products and 49.3 percent to the supply of edible products. Imports were 25 percent of the total supply in 1950, 57.5 percent in 1963, and 62.4 percent in 1964.

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 ABSTRACTER: M. F. Tripple

9.16 (*) FARMING THE SEA FOR MORE FOOD FROM FISH

Shelbourne, I. E. (British White Fish Authority, Port Erin, Isle of Man, Great Britain)
Commercial Fishing 4, No. 5, 19, 21 (January 1966)

World fisheries are entering a transition period. While hunted natural stocks are relied on for fish supplies, international awareness of the inadequacies of unrestricted fishing is growing. The result must inevitably be, first, an intermediate stage of stock conservation, and then the stage when sea fish are domesticated and farmed on a large scale.

Pioneer, small-scale fish farms located in coastal bays and partly enclosed waters may be the first step in providing the basic knowledge, while supplementing local fish supplies, needed to control the elemental forces at work in the open sea, to manipulate production cycles, and to increase the yield of edible fish. British biologists are now attempting to raise the present experimental technique to the status of a mass-production technology. Their goal is 1,000,000 young plaice a year from a moderately sized pilot plant.

A second project involves release of hatchery flatfish into partly enclosed sea areas that have been enriched with agricultural fertilizers. A third is concerned with exploring the possibility of fattening hatchery-reared fry in shore ponds that are irrigated by the warm outflow from coastal power stations. Other projects involve development of a cheap fish food from agricultural byproducts;

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 ABSTRACTER: L. Baldwin

9.3 (*) MANAGEMENT OF THE HIGH SEAS FISHERIES OF THE NORTHEASTERN PACIFIC

Van Cleve, Richard (Coll. Fish., Univ. of Washington, Seattle 98105)
University of Washington Fisheries Publication 2, No. 2, 1-63 (1963)
Sport Fishery Abstracts 10, Abstract No. 7384, p. 58 (January 1965)

A preliminary survey of the pressing fishery problems must recognize that claims to territorial waters by different nations vary in width from 3 to 12 miles, but exclusive claims to fisheries have been extended as far as 200 miles from shore by a few states. Consideration of the consequences of applying different methods of protecting the fisheries in the northeastern Pacific leads to the conclusion that fishery problems there can be solved best by treaties, but these, to be effective, must incorporate agreement on basic objectives. The validity of the abstention principle as defined in the North Pacific Treaty and the need for such protection of fisheries, which are controlled by scientifically based management programs, are shown by the successful management of the northeastern Pacific halibut and salmon fisheries of this area. This is further supported by a consideration of both the biological and economic bases of fisheries management. Maximum sustained yield as defined by the North Pacific Treaty is not considered a sound basis for abstention or regulation, since it has been considered to be an absolute and single valued population parameter that must be defined and supported by biological data. The variability of this quantity makes the optimum economic yield a more usable objective. Consideration of the qualifications for abstention listed in the North Pacific

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 ABSTRACTER: L. Baldwin

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Treaty and the data available on the Bristol Bay halibut stock indicate that the latter fulfills the requirements for abstention. Removal of this stock from the protection by abstention required special interpretation of the present treaty. Evaluation of the legal, biological, and economic background of high seas fisheries leads to the conclusion that future progress in rational development of the northeastern Pacific fisheries will be aided by continuation of the principle of abstention as outlined in the present North Pacific fisheries treaty. Successful operation of the commission, however, seems to require alteration of the treaty to provide the commission with its own research staff and to charge it with the responsibility of handling the problems posed by the treaty and by the fisheries. (Sixty-four references are cited.)

9.3 FISHERY LIMITS "ALMOST UNAMERICAN"

Steele, George E., Jr. (Van Camp Sea Food Company)
Fishermen's News 21, No. 20, 2 (November 1965)

This discussion, one of a series on "International Fisheries and the Law of the Sea," was delivered at the Portland, Oregon, meeting of the American Fisheries Society held late in 1965. It evaluates the reasons for extending the zones of exclusive fishery jurisdiction.

9.16 (Cross Reference: 1.0146)

controlled battery production in marine ponds so that fish farmers can tailor their capital installation to a continuous, predictable supply; and rearing techniques for tropical fish that are particularly fast growing in warm water and thus can be cultivated in coastal lagoons.

9.16 FIVE ACRES OF FISH

Halliday, Ruth
New Scientist 27, 330-331 (August 5, 1965)

Britain has established probably the world's first experimental fish farm for marine fish. The White Fish Authority, in their study of the entire techniques of hatching and raising, have chosen Scottish sea lochs as suitable areas for raising the fish; local processing plants for production of fish products can utilize local labor. If a harvest of fish can be guaranteed with fish of a certain size and taste, and if the harvest produces a reliable year-round supply, the processing industry will benefit.

The original stock of eggs came from captive spawning stock housed in outdoor ponds, but eggs collected from indoor stock should give better results. Because the plaice is a winter spawner, a hatchery could be used simultaneously for raising another species that spawns later in the year, such as the sole. Any fish farm will require supplies of young fish from a hatchery. The hatchery could be attached to the farm, or a central hatchery could serve a group of farms.

Research is being conducted on producing fish that are more efficient converters of food into flesh, those that grow faster, and those that can thrive on cheap forms of food. [Abstracter: M. F. Tripple]

9.15

orders and families collected. A further series of samples taken 13 months after spraying showed no decrease in the number of groups present; and Ephemeroptera, Chironomidae, and Trichoptera, the main food for fish, showed an increase in the number of individuals. In one of the brooks sampled, the numbers in the samples increased during the test period, and chironomid larvae were especially numerous, which is characteristic of streams sprayed with DDT. The results of the Surber sampling were, however, in contrast to the usual observations following DDT spraying where many species are reduced to low numbers and recovery takes years.

Emergence cage samples.--At the upper station on one brook there was a decrease in total number of insects emerging daily into the sampling cages as the stream dried up, but there was no reduction in the number of groups. At the lower station the emergence pattern fluctuated, but again there was no reduction in variety. At upper and lower stations on other brooks, the daily collections showed a general increase in numbers of insects collected as the season advanced. During the second week after spraying with phosphamidon, the emergence increased to high numbers, particularly emergence of mayflies, stonefiles, and miscellaneous Diptera. During the same postspray period, chironomids emerged in great numbers, which verified the results obtained from the Surber samples.

Drift screen samples.--Counts of descending insects collected hourly showed no increase after phosphamidon spraying. An hour or two after DDT spraying, the counts of insects on the screens increased drastically. There was no consistent relation between water level and number of insects collected.

9.2 (Cross Reference: 1.011)

Because the U.S. catch has remained relatively static for the past 25 years, imports are necessary to provide the additional quantity required for U.S. needs. An evaluation of the potential resources available to U.S. fishermen indicates that the catch could be increased to about 22 billion pounds annually--nearly five times the quantity taken in 1964. To harvest the additional fish and shellfish would require new fishing techniques and markets. Much of the increase would have to come from species either not now used or taken in only limited volumes.

The 1964 U.S. catch of 4.5 billion pounds of fish and shellfish was worth $390 million to the fishermen. The value of the catch increased 4 percent, although the volume was 7 percent less than in 1963. The drop in poundage was largely due to reduced landings of menhaden, which were down 249 million pounds, and Atlantic herring which were down 92 million pounds. The 1964 catch was more valuable because of larger catches of high-priced species, such as Pacific salmon, yellowfin tuna, and blue and king crabs. The catch was also more valuable because of increases in the price paid for scallops, shrimp, and northern lobsters.

The amount of the catch used for human food was 2,461 million pounds; the amount for industrial uses--meal, oil, bait, and animal food--was 2,062 million pounds. As compared with 1963, the amount used for human food declined 95 million pounds; compared with 1950, it was 846 million pounds below the record quantity used for this purpose. The amount for industrial uses was 229 million pounds less than in 1963 and 752 million pounds below the record 1962 landings for industrial uses. Fish taken for industrial uses accounted for nearly 46 percent of the total catch, but they yielded only 8 percent of the value.

1.011 U.S. NEEDS NEW OCEANOGRAPHY PROGRAM

Wakelin, James H., Jr.
Chemical and Engineering News 43, 21 (June 21, 1965)

(Abstract of this article appears under 9.11 page 19 - January 1966)

1.0115 REVIEW OF THE DEVELOPMENT OF THE ATLANTIC COAST TUNA FISHERY

Wilson, Peter C.
Commercial Fisheries Review 27, 1-10 (March 1965)

(Abstract of this article appears under 1.120 page 5 - February 1966)

1.3 THE PURSUIT OF SALMON IN IRELAND

Went, Arthur E.
Proceedings of the Royal Irish Academy 63, Sec. C, No. 6, pp. 191-244 (1964)

1.3 PROBLEMS OF THE TROLL SALMON FISHERY AND POSSIBLE SOLUTIONS

Beer, R. M.
Western Fisheries 69, 53-57 (March 1965)

(Abstract of this article appears under 1.01113 page 1 - April 1966)

(Abstract of this article appears under 2.12 page 15 - February 1967)

Anonymous
Western Fisheries 72, 38 (August 1966)

1.3 SCIENTISTS' PREDICTIONS BY OFFSHORE FISHING BEING PUT TO ACID TEST

(Abstract of this article appears under 9.11 page 17 - May 1966)

Dietz, Robert S.
National Maine Coast Fisherman 46, 12 (July 1965)

1.0145 SOVIET OCEANOGRAPHY IN FAST CLIMB

1.0145 THE DISTRIBUTION, BIOLOGY AND FISHERIES OF THE PACIFIC TUNAS

Osipov, V. G.
Translation OTS-63-11118, 6 pp. (1964) price 50 cents, available from the U.S. Department of Commerce, Office of Technical Services, Washington, D.C.

(Abstract of this article appears under 1.12 page 6 - April 1966)

(Abstract of this article appears under 7.89 page 15 - March 1966)

Chalker, Dorothy A., and W. A. MacCallum
Journal of the Fisheries Research Board of Canada 22, 783-791 (May 1965)

1.51 STUDIES ON THE QUALITY OF NEWFOUNDLAND COD.
II - THAW-DRIP IN POLYPHOSPHATE-TREATED AND UNTREATED FILLETS

(Abstract of this article appears under 3.2495 page 9 - March 1966)

Yurkowski, M., and H. Brockerhoff
Journal of the Fisheries Research Board of Canada 22, 643-652 (May 1965)

1.51 LYSOLECITHINASE OF COD MUSCLE

1.33 PROXIMATE COMPOSITION OF SILVER SALMON

Karrick, Neva L., and Claude E. Thurston
Journal of Agricultural and Food Chemistry 12, 282-284 (May-June 1964)

(Abstract of this article appears under 8.0 page 17 - September 1964)

(Abstract of this article appears under 2.12 page 9 - August 1966)

Koto, Hideto, and Tatsuaki Maeda
Bulletin of the Japanese Society of Scientific Fisheries 31, 769-780 (October 1965)

1.69 ON THE MOVEMENT OF FISH SHOALS AND THE CHANGE OF BOTTOM TEMPERATURE ON THE TRAWL-FISHING GROUND OF THE EASTERN BERING SEA

(Abstract of this article appears under 3.19 page 13 - February 1966)

Spinelli, J., M. Eklund, N. Stoll, and D. Miyauchi
Food Technology 19, 126-130 (June 1965)

1.69 IRRADIATION PRESERVATION OF PACIFIC COAST FISH AND SHELLFISH. III - STORAGE LIFE OF PETRALE SOLE FILLETS AT 33° AND 42° F.

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Konagaya, Shiro	13	6.32
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A recent survey by M. E. Stansby, technical adviser to the staff of CFA, revealed that many of our subscribers do not understand the purpose of two somewhat unorthodox expedients we have resorted to in preparing CFA cards: the insertion of reference items at the end of some of the shorter abstracts and, more recently, the placing of these entries in a seemingly topsy-turvy position. All indications to the contrary, both of these changes were made after some deliberation and with studied intent.

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Insertion of short reference items was begun to help us solve our problem of space. As our older subscribers have no doubt long suspected, the number of pages we are authorized to issue each month is strictly prescribed. Only by approval of a special request to the Bureau of the Budget are we allowed to increase the number even by one. As a consequence, short reference items were piling up till we had a backlog of between 600 and 700. All, we felt, were too valuable to be thrown out, but few if any were so valuable that they warranted being put on a card alone. Eventually we decided to cut the backlog down by inserting them in those spots that were going unused--the backs of cards containing short abstracts.

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